The Electrical Industry's Weekly Magazine July 4, 1960

Electrical World

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First 240/480 V Buried System for All Electric Homes Will Be Competitive ...page 42

A NEW LOOK AT COST OF CAPITAL:

Why Not Include Earning's Growth Expectations?... p 69

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ALLIS-CHALMERS

Originators of 5/8% Step Regulators

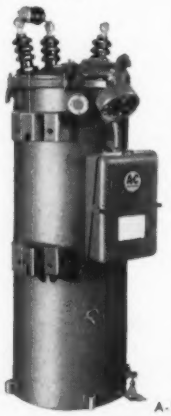
Hang up the "climbers"!

New JFR regulators offer safe, ground-level adjustment

It's standard with Allis-Chalmers! Position indicator drag hands adjust from the ground at the remote control panel. Saves poles, ends risky pole climbing and makes recording of operation range practical. At the push of a button, indicator *drag hands* are reset on large, easy-to-read face with reflecting numbers and indicator hand.

There's much more for you in this all-new design. It's the most advanced regulator on the market today. New sight indicator gives you fast check of oil level. Newly designed cover, with hidden bushing mounting studs, cuts maintenance. JFR's now lower, lighter . . . slashes transportation, handling and installation charges. Ask your nearby A-C office for new JFR bulletin 21B7977E or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

- External by-pass arrester
- Obstruction-free cover
- Electrical resettable position indicator
- Oil sight gauge
- Feather-Touch control



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Feather-Touch is an Allis-Chalmers trademark.

Electrical World

Vol. 154, No. 1 JULY 4, 1960

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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LONG LIFE AHEAD—Here a 1,000-foot run of the record Okonite cable is being pulled into a manhole on Los Angeles' Imperial Highway from a Department of Water and Power cable trailer. The loaded reel weighed 15 tons.

Cable'bility at work

Los Angeles installs oil-filled Okonite cable with largest conductor ever made for 138 kv

Cable'bility (cā'ble·bil'·i·ty) *new word. Noun.* **1.** Ability to design and manufacture electrical cables that give outstanding performance. **2.** Having long background and wide experience in cable research and application. **3.** Possessing keen understanding of customers' problems. Implies eagerness to serve faithfully and dedication to progress. **Syn.** The Okonite Company.

It's a giant, this Okonite cable. Its single conductor is the largest ever made for 138 kv.

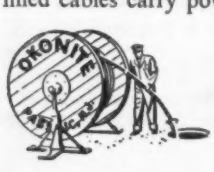
Installed in parallel underground circuits—each seven and three-quarter miles long—these low-pressure, oil-filled cables carry power generated by Los Angeles Department of Water and Power's new Scattergood Steam Plant. Each circuit can carry 231 mva at 138 kv.

The underground installation avoids the use of overhead structures in the vicinity of the Los Angeles International Airport, with its heavy air traffic.

Okonite Cable'bility was on the job long before the cable carried Scattergood's power. There was the cooperation in the cable's design with the DOWAP engineers . . . the painstaking construction and quality control at Okonite's Paterson plant . . . the careful cross-country shipment on reels containing an oil reservoir for each 333 feet of cable . . . the on-the-spot installation aid.

Most important, there was Okonite's 80-year background in designing and producing long-lived cables for other critical jobs.

Why not put Okonite Cable'bility to work on *your* next job? The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.



where there's electrical power . . . there's **OKONITE CABLE**

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LETTERS

Our Understatement Is Showing

To the Editor:

Your May 30 issue carried a staff-written article in the Procurement and Products section bearing the title "New Anti-Friction Watthour Meters Announced." The lead paragraph of this article reported that two meter manufacturers had announced new watthour meters incorporating magnetic thrust bearings at the recent AEIC/EEI Meter and Service Committee meeting at Madison, Wis.

This paragraph went on to state "Thus, with General Electric already in production on magnetic suspension meters, the industry swings toward 'new' anti-friction designs." The incorrect inference in this statement is that GE is also a newcomer to the usage of magnetic bearing systems in its meters and that we had just recently gone into production of the magnetic suspension meter.

The facts in the matter show that GE has been manufacturing magnetic-suspension meters for slightly over 12 years and that nearly 12 million GE magnetic suspension meters are now in service without one magnetic suspension system ever having been replaced because of wear. Such "in service" performance is certainly ample reason why "the industry is swinging toward anti-friction bearings."

A. E. Lindholm, Mgr
Advertising & Sales Promotion
Meter Department
General Electric Co
Commersworth, N. H.

▶ *We bow gracefully to Reader Lindholm's facts, but can't resist adding that inferences are made by a reader—and not the writer—of an article.*

Wx Must Improvx Spxlling

To the Editor:

EW, June 13, p 52, brought a most interesting article on the installation of a 170-kv submarine cable across one of the fjords in Denmark, my native country.

The creator of this new type of flat high voltage cable is known to a great number of electrical engineers in all the Scandinavian countries, and they will surely wonder and feel puzzled to see his name so badly misspelled. Since I knew Mr. Møllerhøj from college days, I trust you won't mind my bringing this to your attention. I realize the American alphabet does not have the letter "ø," but when you also leave out the "h", it looks funny to those abroad.

N. F. Oluf Nielsen
2111 Mulkey St
Corvallis, Oregon

▶ *It is evident that EW's policy of strengthening foreign coverage will require our closer attention to correct spelling and usage of foreign names and terms. And if occasionally this strains the capability of our compositors' type fonts, so be it.*

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Now an oil-resistant rubber with **color**

...*any* color...*any* shade...for almost any rubber product

Color is a facet of function. Color identifies... emphasizes ...warns... attracts or repels.

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And now *all the color you can use* is yours in a synthetic rubber compound so tough, so oil, chemical, weather, and ozone resistant, it actually outperforms other rubbers. No longer need you think in terms of gray, brown, and black for any weather-resistant rubber.

Paracril® OZO—a unique blend of acrylonitrile-butadiene rubber and vinyl developed in the Naugatuck Chemical laboratories of U. S. Rubber—is already demonstrating its product-improvement power in a wide range of highly successful applications. And it's ready and waiting to do the same for *your* product.

Take a look at Paracril OZO. Full information is immediately available from your nearest Naugatuck Representative or the address below.

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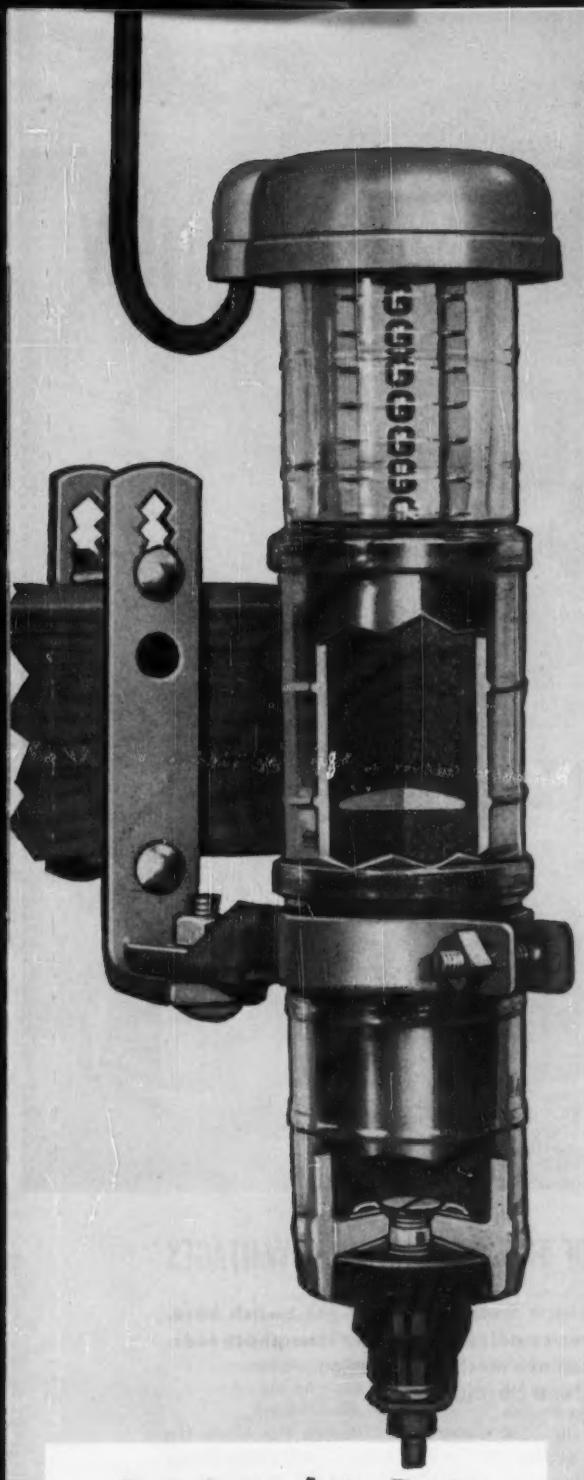

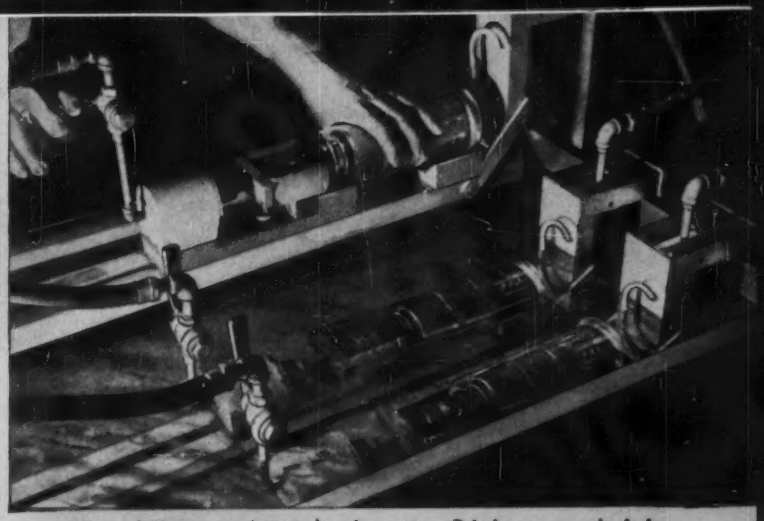

Every L-M arrester is tested under water. Dried compressed air is pumped in, at a minimum pressure of 15 psi. Any leak would produce tell-tale air bubbles. You get no leakers!

100% Testing Proves Seals Keep Out Moisture In L-M Valve Arresters

L-M was the first to use high-grade synthetic rubber —the first fully effective moisture seal. Two-way compression keeps the seals moistureproof, as shown by extensive tests, 20-year service records, with 2½ million arresters in operation.

Long the leader in valve-type distribution arresters, Line Material has also been the leader in sealing against moisture. Extensive laboratory, field, and service tests show that L-M arresters *just don't leak*.

This excellent sealing of L-M arresters is accomplished by multiple elastomer seals, held under compression. As shown in the illustration, both top and bottom are sealed. Even should the insulating cap at the top be damaged and the asphalt compound be removed, the copper cap still contains the synthetic rubber gasket under pressure, positively preventing entrance of moisture. Gaskets are contained on all sides, so there is no cold flow.

Sealing is just one of many excellent features of Line Material Lightning Arresters. Line Material offers a complete line of arresters—from 175 volts to 121 kv., with many intermediate sizes not generally offered. This permits exact application by the distribution engineer.

Get Complete Data

Ask the L-M Field Engineer for information on L-M Arresters, and data on arrester application problems. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.

LM® **LINE MATERIAL®**
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Lightning Arresters
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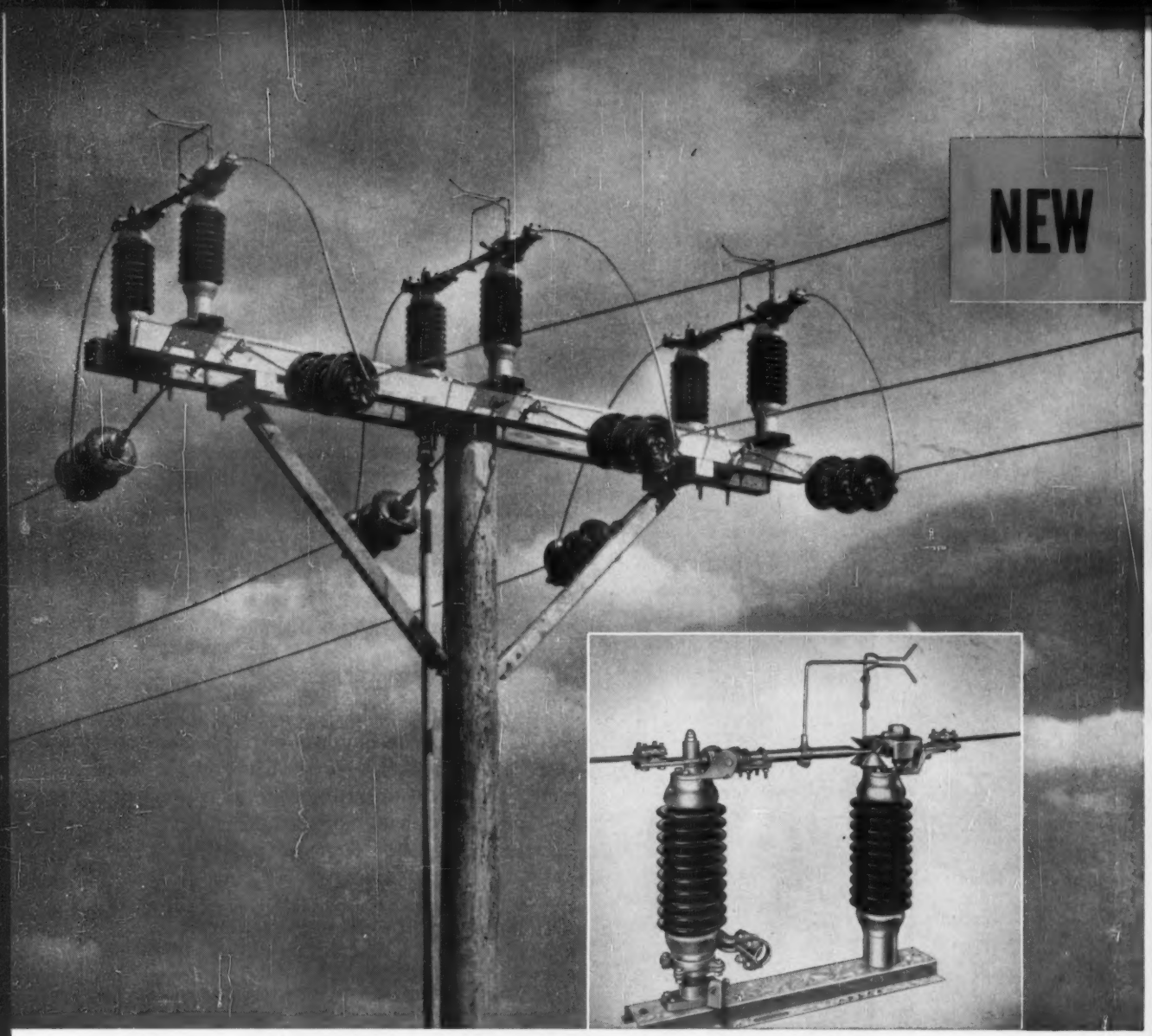
DISTRIBUTION TRANSFORMERS • RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



NO OTHER SIDE-BREAK DISCONNECT GIVES YOU ALL OF THESE OPERATING ADVANTAGES

- **Correct contact always maintained at blade tip even if crossarm warpage distorts the switch base.**
- **All blades engage fully in the break-contact jaws without precise adjustment of the inter-phase rods.**
- **Less time and labor to install with Kearney original wide-tolerance mechanical design.**
- **Easiest, surest ice-breaking ability available on both opening and closing.**

This newest Kearney development solves long-existing operating problems of crossarm mounted group operated side-break disconnects. The best supporting structure or crossarm construction may ... due to ice loads, age, wind or line strain ... deflect enough to distort the switch bases, or alter the relative positions of the three phases. This often causes loss of contact or failure of all blades to close completely in conventional disconnects with both rigid blades and stationary break-contacts.

Kearney's advanced design features a self-aligning blade constructed to permit controlled vertical movement and axial rotation. This automatically compensates for base distortion ... keeps the blade tip correctly aligned in the contacts. The break-contact swings 30-degrees with the blade as it is opened or closed, producing high leverage ice-breaking ability and full wiping of the silver current transfer surfaces. On closing, the blade tip fully engages the break-contact before the contact moves from its angular open position, compensating for any shift in position of the switch bases. This same feature also allows considerable freedom in interphase rod adjustment, enabling Kearney ***Self-Aligning*** side-break switches to be installed faster and more economically than other types.

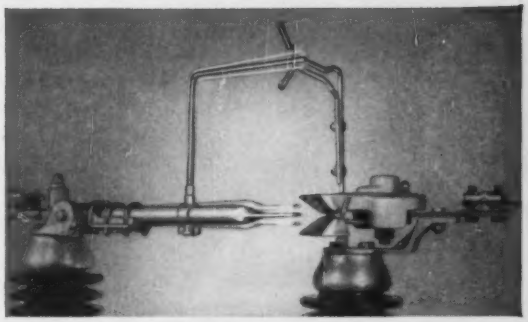
The details of these original features for maintenance-and-adjustment-free operation are shown on the facing page.

Kearney's

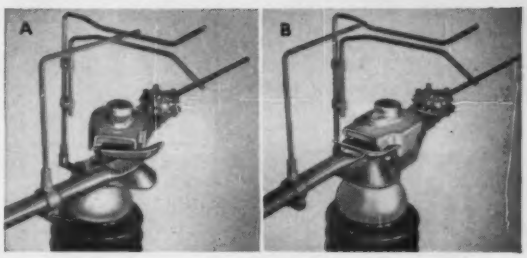
Self-Aligning SIDE-BREAK DISCONNECTS

...always make positive contact, even if the supporting structure warps, twists, bows or settles.

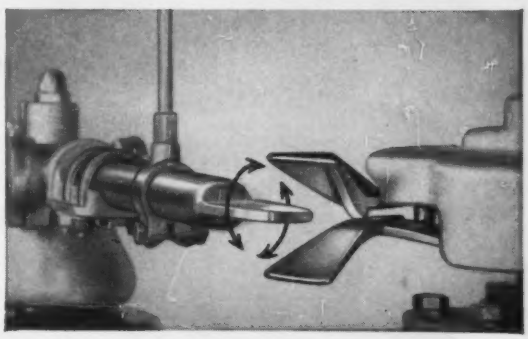
Self-aligning blade moves in a vertical plane to re-establish the original relationship between blade tip and contacts if supporting structure warpage distorts switch base. Wide mouth contact jaws assure blade entry into the contacts. Vertical 1¼" movement more than corrects for extreme cases of misalignment.



Break-contact swings 30° in the plane of blade travel as switch is opened or closed, providing highest leverage ice-breaking and full wiping of the current transfer surfaces. Note that the blade tip is fully engaged, and full contact is maintained (A) through the final 20° of blade travel to the fully closed position shown at (B). This feature allows more latitude in phase rod adjustment than other designs.



Blade rotates 12° on its longitudinal axis. If base distortion has affected blade-contact alignment, the blade tip will rotate as it enters the break-contact to keep all contact surfaces parallel, automatically restoring contact alignment. Friction reducing construction at all rotation points minimizes operating effort.



Switch carries full-rated load current well within NEMA temperature rise, from a fully closed position to 20° partially open position. Ratings available, 7.5 through 69 kv, 600 amperes. Equipped with conventional or whip-type arcing horns... torsional or spade-type operating mechanism. May be mounted horizontally, vertically, or underhung.

For full details talk to your Kearney representative, or write direct for Bulletin 8B.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

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FOR BETTER CONSTRUCTION... SAFER MAINTENANCE

Specify Kearney Products

Plants at: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

We make 'em good . . .

and we keep 'em uniform!

Sometimes you have to build new tools to do the job right. Like this automatic trimming machine. We designed it and built it, here at Lapp, because there just wasn't any other way as good to produce insulator shells precisely right in size and shape.

We're just as finicky about every phase of insulator production, from clay slurry to final flashover testing. We keep 'em uniform. And as we develop new improvements, you get the benefit of them in *every* insulator that leaves our plant.

You can read the results in operating records. Less maintenance . . . lower replacement costs . . . fewer interruptions of service. Because the uniformity of Lapp suspension insulators keeps performance to your specifications. Something to bear in mind next time you order.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

'BUFFALO' – MOST COMPLETE LINE OF QUALITY HEATING, VENTILATING AND MAKEUP AIR UNITS

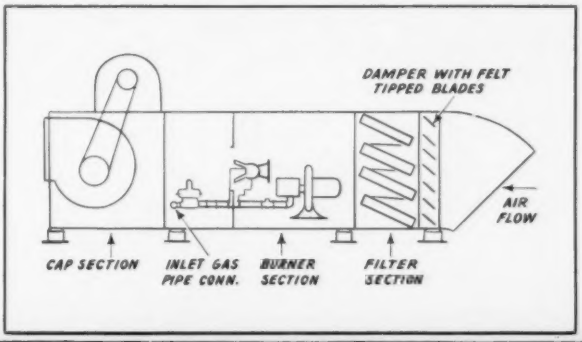
Whatever the air temperature requirements for your boiler room, turbine room or other plant areas, there's a 'Buffalo' Unit to give you permanent satisfaction. All embody the same quality engineering as the broad line of 'Buffalo' Mechanical Draft Fans.

For ventilation, you have 'Buffalo' Centrifugal, Propeller and Axial Flow Fans to choose from, depending on space, pressure and volume requirements. All are proven fans for specific design conditions, and may be used for supplying makeup air or exhausting.

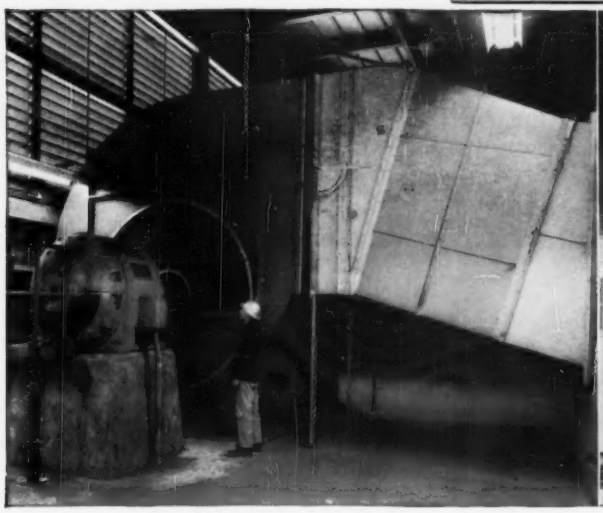
Sky Vent Power Roof Ventilators are efficient, weather-proof packages for economical installation without duct or floor space requirements. Available in 1,000 to 250,000 cfm capacities, and can be arranged with heating coils and dampers for supplying makeup air.

New 'Buffalo' Direct Gas-Fired Makeup Air Units provide fresh, clean, tempered air without increasing boiler load. Units operate at virtually 100% thermal efficiency, with complete safety and freedom from attention. Can be built into Style H Sky Vent units. Also available with centrifugal blower head and accessories such as filters, dampers, etc.

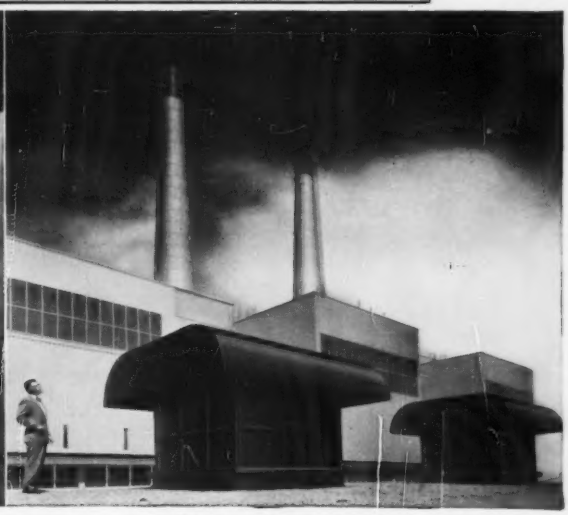
Write us about your heating, ventilating or makeup air problem—we'll give you details and recommendations promptly.



'Buffalo' Direct Gas-Fired Makeup Air Unit



'Buffalo' Type BL Ventilating Fan



'Buffalo' Power Roof Ventilators

"Buffalo"

BUFFALO FORGE COMPANY

Buffalo, New York

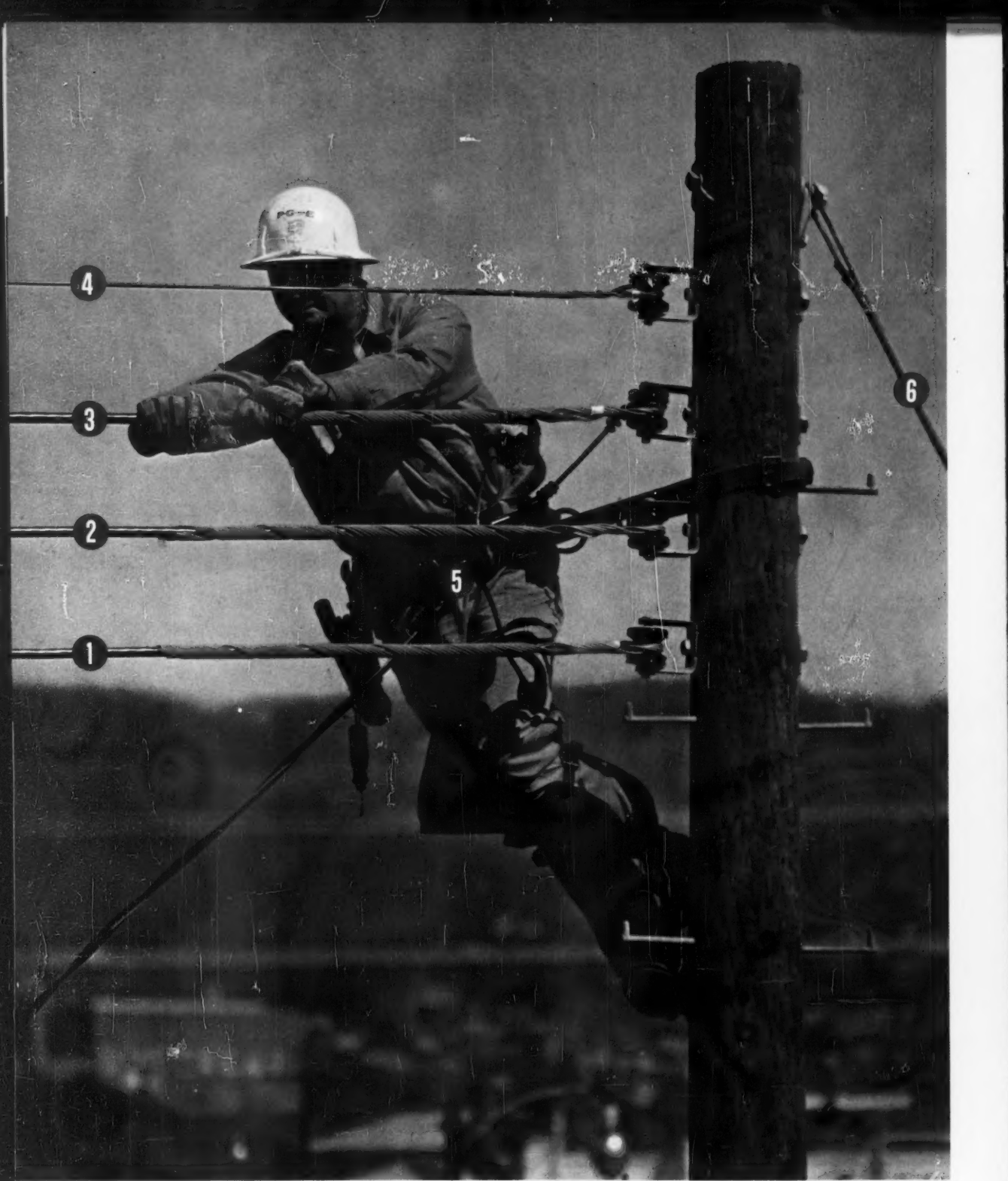
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.



❶ – ❸ Preformed NADEs on secondary application—Polyethylene Covered All-Aluminum conductors, size 397.5 MCM being installed by Pacific Gas & Electric Company.

❹ Preformed NADE on Polyethylene Covered All-Aluminum street lighting circuit.

❺ Preformed Dead-End for Triplex bare neutral application.

❻ GUY-GRIP dead-end for $\frac{3}{8}$″ galvanized steel strand.

USE *Preformed* TRADEMARK

NEOPRENE-COATED DEAD-ENDS FOR WEATHERPROOF CONDUCTORS COVERED WITH NEOPRENE OR POLYETHYLENE

With *Preformed* TRADEMARK Neoprene-Coated Dead-Ends (NADEs), the jacketing on the conductor remains intact. Labor and potential corrosion problems are reduced. No bulky fittings to be taped.

NO FEAR OF CAPACITANCE EFFECT, which can break down the covering, thereby creating NOISE; also reduce the mechanical holding strength.

NO STRIPPING OF THE COVERING, therefore **NO EXPOSURE OF THE BARED CONDUCTOR TO CORROSION** from coastal or industrial contamination.

NO DAMAGE TO CONDUCTOR JACKETING from bending the conductor around the hardware.

NO EMBEDMENT. Low localized radial pressures are distributed over wide area to develop maximum holding strength.

NO WEDGING DEVICES AND HIGH CONCENTRATED STRESSES. Groups of individual wires, bonded together with Neoprene, create bands which gently grip the conductor along the entire contact length of the *Preformed* TRADEMARK Dead-End.

Tapping to conductor tails.

ARE YOU WONDERING HOW MANY *Preformed* TRADEMARK NEOPRENE-COATED DEAD-ENDS HAVE BEEN PURCHASED DURING THE PAST THREE YEARS?

Here's The Answer:

139 ELECTRIC UTILITIES have purchased nearly 300,000

PREFORMED LINE PRODUCTS COMPANY

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600 Hansen Way • Palo Alto, California

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Patented — U.S. Patent Number 2,761,273

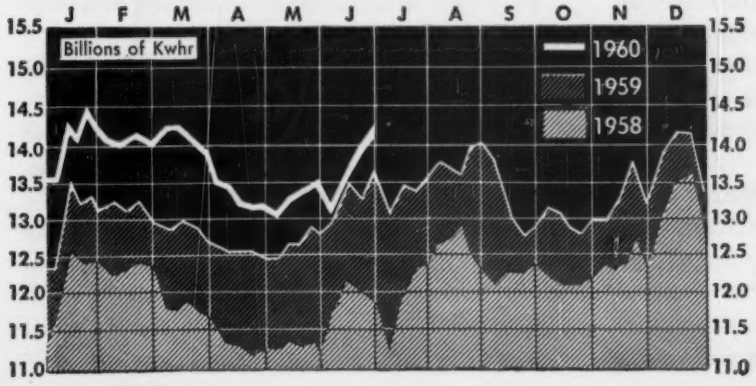
The Electrical Week

LATE NEWS ▶ **Washington Wire** . . . Amistad Dam Authorization Bill goes to White House for expected signature by President Eisenhower. Bill calls for joint construction by US and Mexico of dam across Rio Grande. US side would have 100,000-kw federal generating station . . . FPC proposes revision of its "Power System Statements" to include listing of manufacturers of boilers, prime movers, generators and transformers in power stations. FPC will accept comments until Aug. 1 . . . Senate Interior Committee asks Interior Department to hold up negotiations with Pacific Gas & Electric Co on proposed Bonneville-PG&E intertie until the committee can consider (1) a study of two 500-kv transmission lines recently completed by H. Zinder & Associates, and (2) necessary legislation to protect the power supply of Bonneville preference customers.

Around the States . . . Construction crews start work on South Fork project of Oroville-Wyandotte Irrigation District, Calif., within hours after award of contract to combine headed by Guy F. Atkinson Co. Bid is $62 million . . . Louisiana's House of Representatives passes bill allowing public utilities to pass on to consumers any tax levied by a municipality. Some called it "taxation without popular approval," others say it is designed to confine taxes to city areas where revenue is needed . . . Public Service Co of Colorado presents gas and electric rate schedules that will bring the $4.3 million new revenues authorized by state PUC . . . Cleveland Electric Illuminating Co wins tough battle to keep transmission lines above ground in residential areas . . . Paducah, Ky., considers purchase of Kentucky Utilities Co distribution system.

Management Changes . . . D. C. Frisbee named vp and treasurer, Pacific P&L . . . David Cass-Beggs, general manager, Saskatchewan Power, elected president Canadian Electrical Assn.

WEEKLY POWER OUTPUT—UP 3.4% (Week ending June 25), Kwhr 14,213,000,000



Per Cent Change From Previous Year

	June 11	June 18	June 25
Total U. S.	+ 1.9	+ 3.4	+ 3.4
New Eng.	− 0.1	+ 3.8	+ 4.3
Mid. Atlan.	− 1.7	+10.3	+ 3.4
Cent. Ind.	− 3.0	+ 1.8	− 1.7
West Cent.	− 0.8	− 0.7	− 1.6
Southeast	+ 3.6	+ 5.3	+ 4.3
South Cent.	+10.8	+ 5.2	+10.7
Rocky Mount.	+ 7.9	+ 5.4	+ 6.3
Pacific			
NW	+ 3.6	+10.8	+ 7.8
SW	+ 8.9	+ 9.9	+ 6.5

Seasonally Adjusted Index 267.4

Week Ago 268.0 Year Ago 250.3

Source: Edison Electric Institute

Preview of This Issue

EVENTS ▶ **AEC wants a rehearing on safety ruling against Enrico Fermi A-plant** (p 32) . . . Middle South files brief countering SEC staff opposition to its stock-option plan (p 32) . . . AEC has OK'd 50-Mw reactor proposed by Los Angeles and Pasadena (p 33) . . . Burns Creek approved by House Interior Subcommittee (p 34) . . . CIGRE meeting opens in Paris (p 36) . . . World Power Conference in Madrid drew 2,000 (p 37) . . . EEI organizes task force on computer uses for utility engineering (p 37).

ENGINEERING ▶ **What's the best way to add peak capacity?** Answer: There isn't any set way; it depends upon the individual system. Its location and such factors as the magnitude and duration of its peak load enter into the economic determination of how to add those top-of-the-curve kilowatts (p 38) . . . Underground distribution at 240-/480 v will compete economically in supplying new high-class total electric home development in Maryland (p 42) . . . The largest US shopping center—large enough to be called a "complex"—will be served with 11-kv underground via three single-conductor cables. It's known as Lloyd Center, and it is located in Portland, Ore. (p 44).

PROCUREMENT & PRODUCTS ▶ **US Supreme Court ruling could affect utility purchasing.** The Court has ruled that Federal Trade Commission has the right to prohibit

Politics and Public Power

CONGRESS AND CONSISTENCY

No one has ever been so audacious as to suggest seriously that Congress is or should be consistent. Not even Congressmen see logicality as a virtue; nor do US Senators, who believe they have a basic right to individuality as well as to engage in the "free and unlimited coinage of words."

But even some of the most sophisticated (or cynical, depending upon your point of view) Washington observers of the Congress were aghast last week at the utter lack of consistency as members worked on two tax bills.

While the House Ways and Means Committee was recommending legislation (the Boggs bill, EW, June 27, p 13 & p 38) to give a businessman some tax-deductible elbow room in legislative and political matters affecting his business, the Senate was voting wildly to prevent the same businessman from engaging in normal social intercourse with his customers and suppliers.

To put it mildly, the contrast between House and Senate actions was a ludicrous example of political vote-luring. One veteran Washington newspaperman went so far as to say that if "that's the sort of thing we'll get between now and adjournment, we'd all be better off if Congress went home today!"

The details of the legislation involved make the contrast seem all the sharper—and sillier.

The Boggs bill in the House attempts to clarify just what kinds of lobbying, legislative, political, and other actions "in the areas of public controversy" are tax deductible. (It is also an effort to ease an Internal Revenue Service regulation tightly controlling such expenses.) It would permit most lobbying expenses, and would allow as busi-

regional price-cutting if it restricts competition . . . Look for the unveiling later this year of smaller American-made trucks (p 56) . . . I-T-E Circuit Breaker Co develops new 4,160-kv switchgear . . . Allis-Chalmers and Bell & Howell buy Consolidated Systems Corp, a West Coast electronics firm well known in the instrumentation and data-processing fields (p 58) . . . Lightning arrestor has improved pressure-relief design that guards against arrestor explosion . . . Converter transfers data from punched paper to magnetic tape . . . Cathodic protector automatically regulates current (p 64).

MANAGEMENT ▶ **How should you figure the cost of common capital?** A growing faction now insists that price-earnings ratios, traditionally relied upon, are no longer a valid guide. Reason: The lure of higher future earnings is, in itself, now part of the compensation attracting common money. If this view is accepted—higher future earnings must be considered part of today's cost of capital (p 69).

SELLING ▶ **The cry of "Play Ball!" will mean added load for many utilities** as more cities build ball parks. Lighting and heating will be hits (p 73).

NEXT WEEK ▶ **New Los Angeles** airport terminal will be served with 34.5 kv **U/G.**

ness expenses, the dues businessmen pay to trade and professional associations. Campaign contributions, of course, would be out.

Meanwhile, the Senate was working feverishly to eliminate the cost of all business entertainment and gifts as tax-deductible except those for meals and hotel accommodations. At one point, the debate in the upper chamber almost made spending for conventions (not political ones), promotions, opening of new plants, unveiling of new products, etc., sound like tax evasion! The provision was dropped finally when a House-Senate conference completed work on legislation to continue the 52% corporate income tax and the so-called Korean excise taxes. But the brilliant outburst of righteousness from the crusading Senators lives in memory.

And just what did all this crusading at cross-purposes add up to?

Well, the tax-lobbying bill is ready for House action, but will probably get sidetracked in the adjournment rush. It will be revived for early consideration next year.

The Senate action is dead, of course. But instead of mounting the bastions, that august body might have pointed out that while a number of businessmen overdo it with their "free-loading" and "night-clubbing," there is a middle ground in which entertainment expenses are necessary, proper and lawful. It might have given serious consideration to having its members set an example of proper living in this expense-account economy, and to alleviate flagrant abuses.

Finally, at the very least, the two chambers might have made some attempt to coordinate their thinking, to be consistent. But, alas, in the home stretch of an election year, consistency from Congress is too much to hope for.

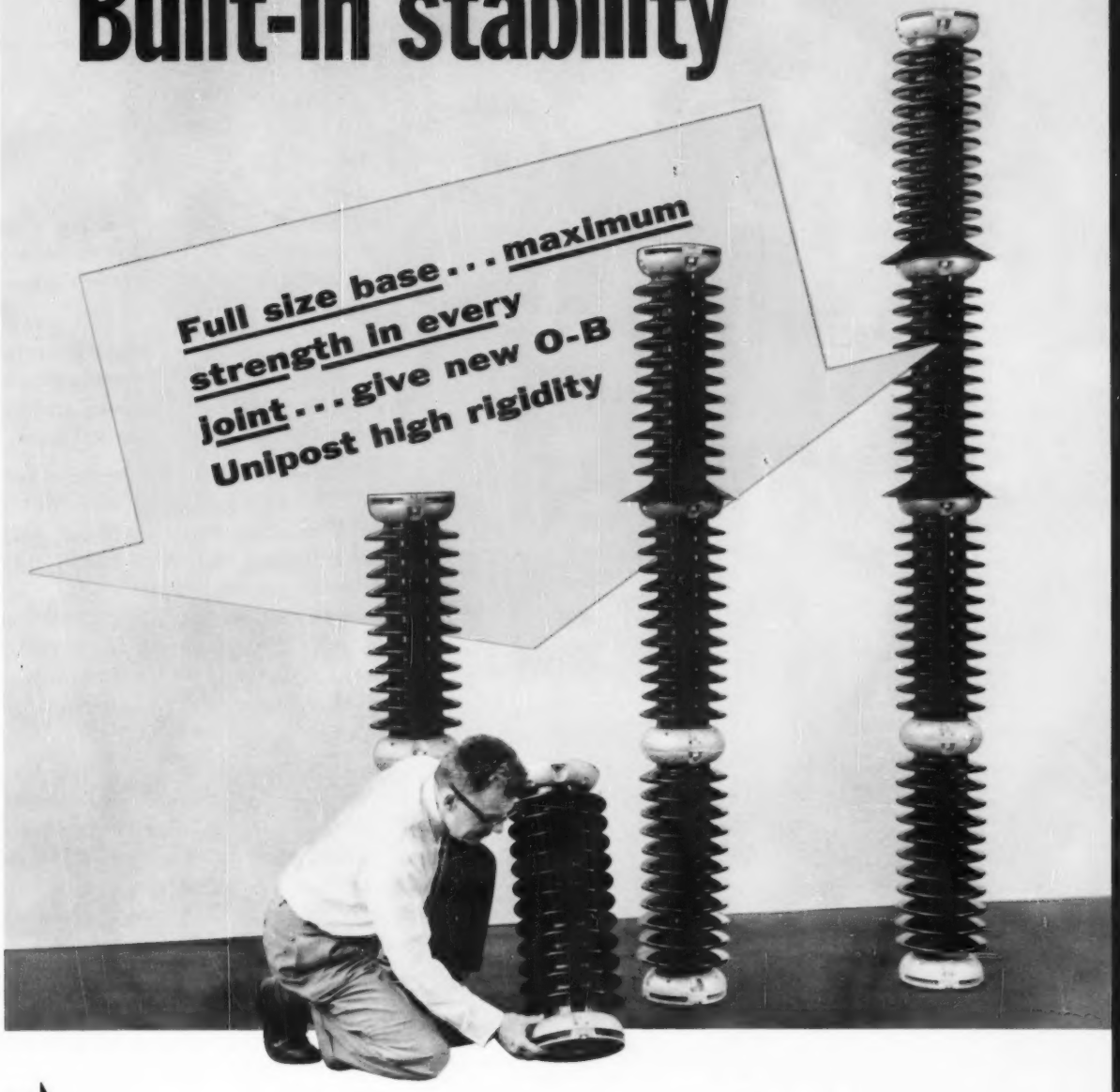
Today most REA-financed systems are in good shape. Many are both able and willing to invest appreciable amounts of their own funds in extensions and additions to plant. By and large, co-ops desire freedom from dependence on Uncle Sam and are willing to take their chances along with private businesses. It is the objective of the Rural Electrification Administration to help every co-op achieve sound fiscal and operational strength so that it can function as an independent enterprise. **Toward Greater Freedom, David A. Hamil, Administrator, REA, Public Utilities Fortnightly, June 9, 1960.**

A sale and a purchase are just two aspects of the same transaction. Building from this base, a new bulletin suggests several ways in which buyers and sellers can work more closely to their mutual advantage. Price-volume-cost relations, durative procurement value and other topics that affect buying and selling in all industries are discussed. Value is examined from both the "value-in-use" and "value-in-exchange" aspects. The fluctuation of price behavior—important to the analysis of "pricing wisdom"—is interpreted in a variety of charts. **Buying and Selling in an Industrial Market (Bulletin GET-3029), D. K. Blake, consultant, User Industry Sales Dept, General Electric Co, Schenectady 5, New York.**

A study of the effect of creosote-penta mixtures on calves brought forth these conclusions: 1. Single applications of any of three substances tested to the clipped skin of calves caused irritations which persisted for some four weeks. 2. A 300-lb calf will tolerate a pound of any of the three substances fed over a two-month period without appreciable detrimental effect. 3. Formation of chloronapthalenes capable of causing hyperkeratosis (X Disease) did not take place during treatment of poles with 2% penta in creosote. **The Toxicity of Creosote and Creosote-Pentachlorophenol Mixtures to Cattle, Monograph 3461, P. Olafson and J. Leutritz, Jr, Bell Telephone Laboratories, 463 West Street, New York 14, N. Y.**

Cash expenditures by the federal government in the late 1950's rose about 34 times since the mid-20's, while the gross national product rose about five times in the same period. Personal disposable income is not much more than four times the level of 1927 . . . The truth seems to be that we are caught in a vicious circle in which the people's abilities to take care of their own needs are hampered by the burden of taxes. Paying so much in taxes, the citizen is tempted to think it is only right to get something back. Hence the "needs" that government sees for more and bigger subsidy programs which in turn require financing by still higher taxes, or inflation. And inflation, hitting the weakest and helpless hardest, creates still more "needs." **Private Affluence and Public Poverty, Monthly Letter, First National City Bank of New York, June 1960.**

Built-in stability



All insulating units of the new O-B stacking Unipost are exactly alike - - in their ability to fit anywhere in a stack - - in construction - - in maximum assembly strength. Because they are fully interchangeable, they save you about two-thirds your inventory cost. But there's still more to the story.

Large bolt circles are retained at the top and bottom of the stack. These are reduced to your choice of two different smaller circles by means of the Uniplate. Because of this unique construction, the O-B insulator stack has three times the base area of one using small end caps.

Broad base, plus maximum strength in every joint, gives the Unipost stack inherently high stability and rigidity. This is a definite asset in switch applications - - desirable in any use.

Only the broad-based interchangeable Unipost gives you this improved design. Specify the O-B Unipost on your new switchgear, and in your new station construction.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
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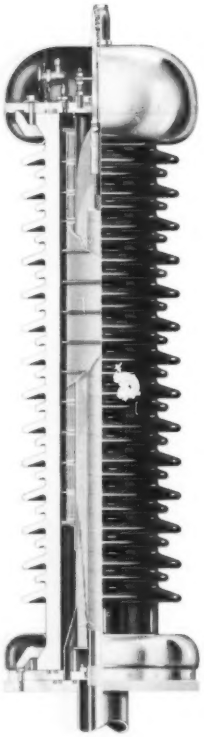
HOLAN

10011-H1

Most advanced pothead



Smoothest transition from line voltage to ground, so far obtained in cable terminal equipment, is found in the new O-B capacitor-graded pothead.

Stacked, series-connected internal capacitors occupy a major portion of the pothead's total height. This results in a greatly-elongated gradient and elimination of all localized electrical stress.

Remainder of the pothead height is occupied by O-B's exclusive spiral stress cone. This is produced by attaching a foil strip to one surface of the paper buildup roll. As a factory operation under precise control, this strip is set at a carefully computed angle. When the roll is tightened on the cable, the foil automatically forms a smoothly shaped, helical stress cone which provides precise electrical stress control in this very critical portion of the cable termination.

From line energy to ground, the new O-B pothead embodies advanced developments and superior electrical techniques. A maximum number of factory-assembled components and simplified installation procedures give greater assurance of fully exploiting every design feature in the hands of regular construction personnel.

O-B capacitor-graded potheads are applicable to any type of underground cable, presently 115 kv and above. We will be glad to lay the facts before you relative to this new terminal equipment. Give it careful investigation if you anticipate future cable projects.

OHIO BRASS COMPANY, MANSFIELD, OHIO

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HOLAN

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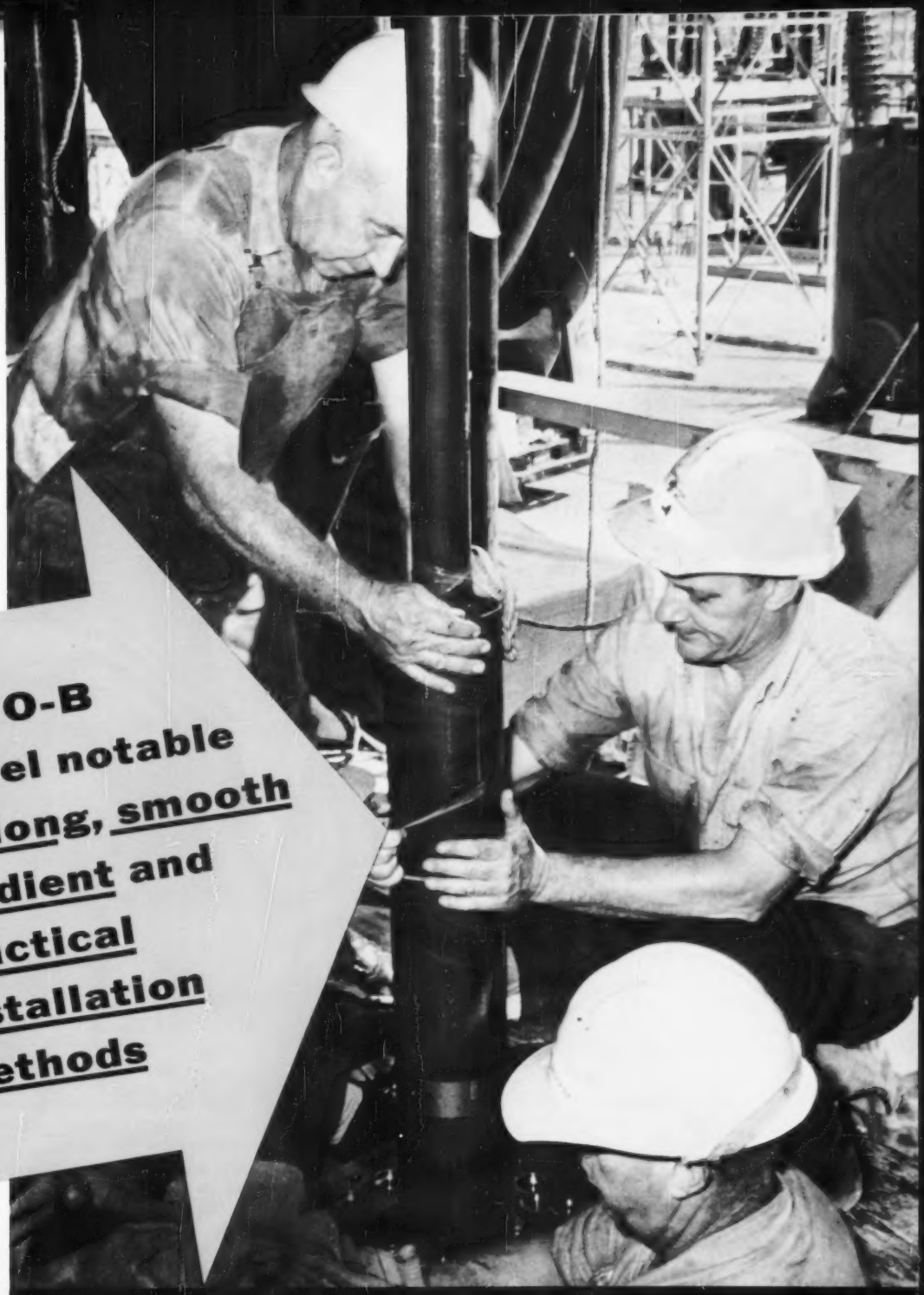
10011-H23

New O-B model notable for long, smooth gradient and practical installation methods



Installing lower buildup roll of O-B capacitor graded pothead. Beneath the outer layer of paper can be seen the end of the continuous foil strip which forms the spiral stress cone. This strip is attached at the factory at a predetermined angle so that, when wrapped, it will generate a conical form of desired shape and flare. Hundreds of turns, each separated only by one thickness of paper, eliminate any stepping effect. The once complicated operation of making the stress cone is now highly refined and reduced to an automatic process through O-B's improved pothead design.

Why insulate a spring?

Dielectric sleeve prevents current flow through ferrous spring metal . . . eliminates annealment hazard . . . helps assure O-B bushing dependability

When you put total dependence on a thing, it deserves total protection. All bushings employ endwise spring compression for assembly. But only O-B keeps its springs entirely out of the electrical circuit. Therefore, the ferrous spring metal cannot become heated, cannot slowly anneal and lose compressive force, nor can springs be subject to sudden high currents during short-circuit conditions.

Base of the O-B oil reservoir, against which springs bear, is insulated from the central conductor by a dielectric sleeve. Even a slight current flow through the springs is thus prevented. For all practical purposes, they are in an open circuit.

This is just one of many techniques of design O-B has learned in some 50 years of successful bushing manufacture. Such background is largely responsible for O-B's consistently fine performance record through progressive generations of development.

All you need to do in order to get O-B's traditional dependability is to state a preference for O-B bushings when new apparatus orders are placed.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

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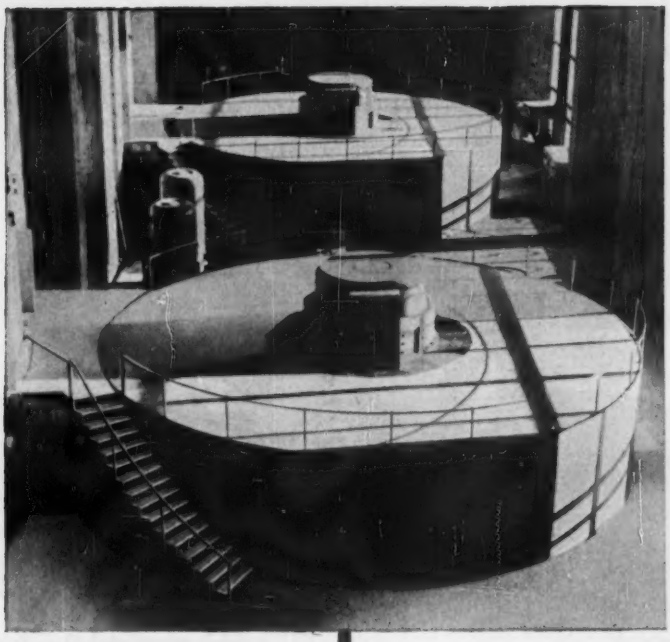
10011-H4



AEG 55 MVA generators in Petäjäskoski Power Station, Finland

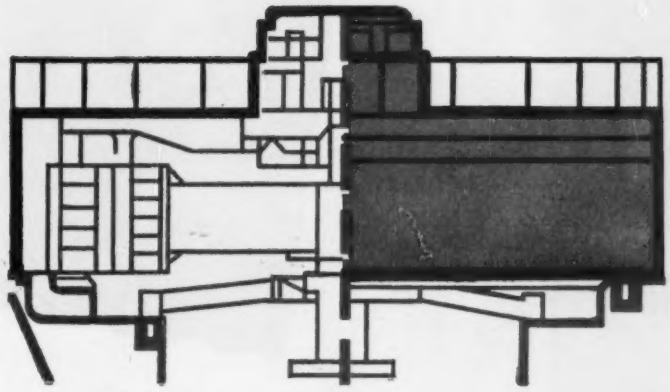
AEG

In all parts of the world where natural resources are harnessed to provide the increasing demands for electrical energy

AEG waterwheel alternators

have proved their unfailing reliability.

More than sixty years experience, skilled craftsmen, specialized research and production methods, ensure first-class technical design and quality of the equipment.



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ALLGEMEINE ELEKTRICITÄTS-GESELLSCHAFT

Berlin (West) EXPORT DEPARTMENT Frankfurt (Main)

Another Orangeburg first...
the Lady in White presents...
exclusive, new
Orangeburg klean-kote conduit available with flush, CA (Coupling Attached) at no additional cost. FL (Fork Lift) units of Orangeburg Conduit in truck-load shipments save you time, space and handling.
* KLEAN-KOTE IS A TRADE-MARK; U. S. PATENT APPLIED FOR. ORANGEBURG KLEAN-KOTE DISTRIBUTED BY GRAYBAR ELECTRIC CO. AND GENERAL ELECTRIC SUPPLY CO. WITH BRANCHES AND STORES IN PRINCIPAL CITIES.

Cleaner Hands

Handle a length and you'll see little or no black rubs off. New *klean-kote* Orangeburg Conduit is much cleaner than ordinary *un*-coated conduit.

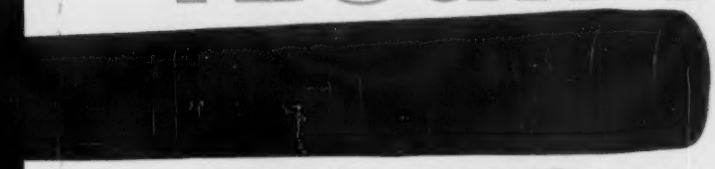
Cleaner Clothes

Completely sealed with durable coating, new *klean-kote* Orangeburg Conduit won't "smudge" on clothing. Cleaner to handle, store and install.

No Irritation

There's virtually no dust or soot to cause annoying irritation to face, hands or arms. New *klean-kote* conduit is another exclusive with Orangeburg.

klean-kote*



ORANGEBURG®

Fibre Conduit

A development of Orangeburg and Flintkote Research Laboratories, new *klean-kote* Orangeburg Fibre Conduit has a tough, non-brittle, protective coating for cleaner, safer handling.

To you and your men, this literally means cleaner hands, cleaner clothes and little or no chance of hand or face irritation. In addition, new *klean-kote* travels better. Weathers better. Joins better.

Best of all, nothing has been changed in the traditional fine quality of the Orangeburg product. New *klean-kote* is just what the name implies —*a clean coating*. Beneath this protective coating lies the same quality product, manufactured with the same painstaking care which has made Orangeburg the best-known, best-selling line in America.

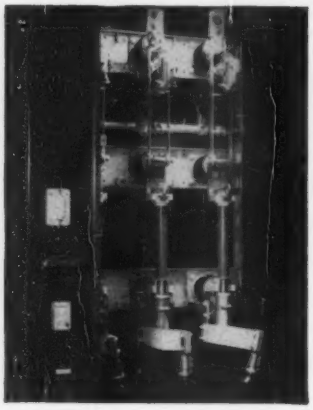
Ask your Orangeburg Wholesaler to show you a length of new *klean-kote* and place your order now.

Orangeburg Manufacturing Co., Orangeburg, N.Y. • Division of The Flintkote Company

FLINTKOTE

Manufacturer of America's Broadest Line of Building Products

SEES ALL YOUR FAULTS



Inside view of typical bay, showing load interrupter (for switching), power fuses, and out-going pothead.

A Power Fuse both senses and clears short circuits— cuts cost of metalclad switchgear 50%

With S&C Metalclad Switchgear you get dependable protection for your high-voltage power circuits at about half the cost. How? Partly through the use of S&C Power Fuses instead of circuit breakers and relaying.

The power fuse is self-sufficient. It needs no instrument transformers, no relay. There is nothing to set, adjust, test, or maintain. You don't need special equipment or skills. After the fuse clears the fault and the cause has been corrected, you simply reach for a $13.50 refill stored in the compartment door.

Power fuses give you the protection you need against permanent destructive faults. Industrial and commercial high-voltage power circuits are not subject to transient faults (such as lightning, falling trees, wind, ice, rodents) and so don't need the automatic reclosing feature of the circuit breaker.

S&C fused interrupter gear meets the new National Electrical Code requirements for fault closing. It is available in short circuit interrupting ratings up to 500 mva at 14.4 kv, 250 mva at 4.16 kv. Continuous current ratings are 200, 400, and 720 amperes. Maximum capacity of main bus, 2000 amperes.

S & C ELECTRIC COMPANY

4421 Ravenswood Avenue · Chicago 40, Illinois

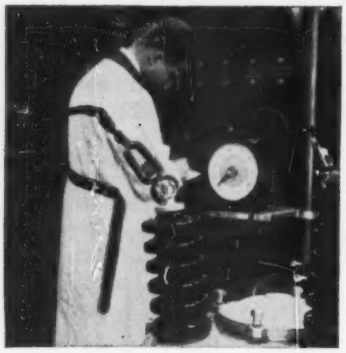
Specialists in High Voltage Circuit Interruption since 1911

S&C

SUPERIOR PERFORMANCE BECAUSE...

MOLONEY DISTRIBUTION TRANSFORMERS ARE DESIGNED AND MANUFACTURED TO MEET ALL SYSTEM REQUIREMENTS

1



Research and Development Laboratory—A continuous program by R & D personnel is in progress at Moloney to improve design theories and procedures to keep pace with the ever changing needs of the electric utility industry. In 1959 these facilities were doubled and the most modern equipment available was installed. Thus Moloney continues to maintain its unique position of independent leadership in the ability to solve utility transformation problems.

2

Materials Testing Laboratory—Material must pass rigid tests to prove that it will contribute to the overall performance of the transformers, before approval. Then, detailed specifications, describing the high quality required, are sent to suppliers. To assure that these high standards of quality are maintained, materials are constantly tested (i.e. oil for contamination by foreign matter or water, core steel for watts loss per pound, etc.).

3

Modern Assembly Facilities—Most utilities maintain only a minimum inventory of spare transformers. Manufacturers, therefore, must be in a position to produce replacement stock quickly and efficiently. Moloney is well equipped to do this because its modern assembly lines are designed for high capacity and are flexible enough to manufacture units having special features without interruption of production schedules.

Comparative analysis of distribution transformers invariably leads to one conclusion . . . the best distribution transformer has all characteristics of design carefully developed in respect to their contributions to system efficiency, dependability and economy.

In Moloney Distribution Transformers, no one feature, electrical or mechanical, is radically improved at the expense of another. Instead, each part of the design is carefully considered and balanced with the others, to provide a distribution transformer that will give the best all-around system performance.

Utility systems benefit from this philosophy of design because every Moloney Distribution Transformer feature is designed to perform in the best possible manner compatible with every other aspect of the design, and thus provide "More Power To You."

To assist in the development of the design and to implement design decisions, modern, extensive manufacturing, research and testing facilities are required. Here are some of the outstanding facilities at Moloney which are used in the manufacture of distribution transformers:

Research and Development Laboratory • Seal Testing
Materials Testing Laboratory • Modern Assembly Lines
Quality Control Check Points • Automatic Electronic Testing

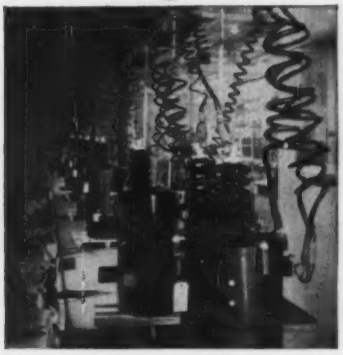
Since 1896 . . . MORE POWER TO YOU!

MOLONEY ELECTRIC COMPANY
ST. LOUIS 30, MO., AND SORNOYO, ONT., CANADA
SALES OFFICES IN ALL PRINCIPAL CITIES

4

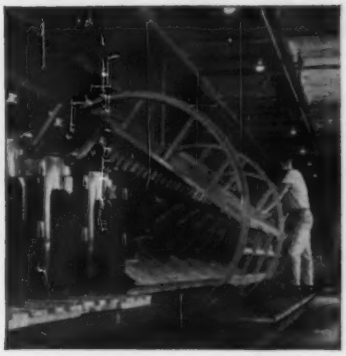
Quality Control Check Points—Moloney Manufacturing Standards are distributed to every department for the guidance of employees. These books contain complete instruction on methods to be followed, material to be used and special customer requirements. Following every major step of manufacture, quality control checks are made to verify that design and manufacturing instructions have been followed.

5



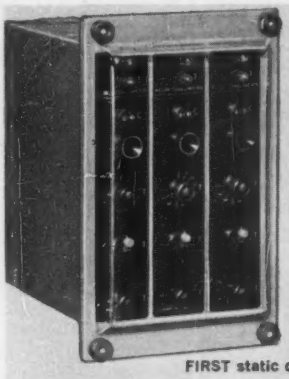
Automatic Electronic Testing—The patented, automatic electronic testing system was designed and installed by Moloney engineers to eliminate human error. Every distribution transformer receives these final tests: ratio, impulse, induced potential, applied potential, core loss, exciting current and CSP breaker tests when applicable. Any unit which fails is automatically rejected and examined to determine the reason for failure.

6

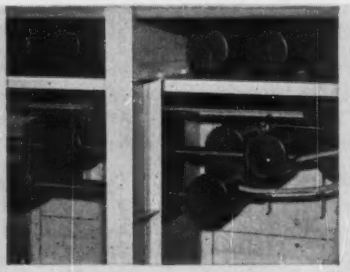


Seal Testing—After manufacturing and electrical testing has been completed, every transformer receives an inversion test. The transformer is inverted until the weight of the oil pressing against all openings reveals even the slightest fault in the gasket seals. This test gives positive and important assurance that the transformer is sealed against damage due to moisture and foreign matter.

ALLIS-CHALMERS



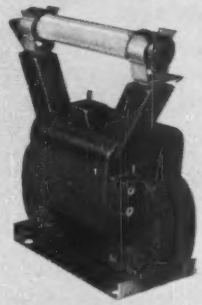
FIRST static overcurrent relays



FIRST with track-resistant, glass polyester insulation with primary stud and bus joint

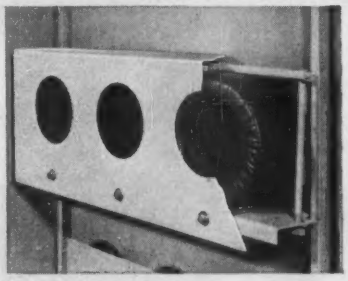
FIRST eye-level instrumentation switchgear

FIRST Aluma-Clad walk-in aisle switchgear

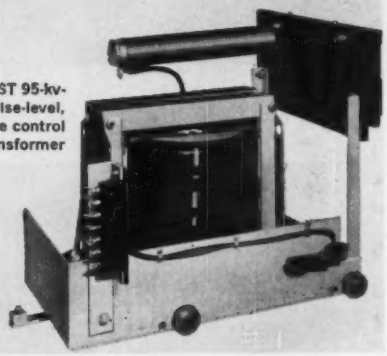


FIRST epoxy-resin potential transformers, trunnion mounted

FIRST front-access current transformers



1ST



FIRST 95-kv-impulse-level, dry-type control power transformer

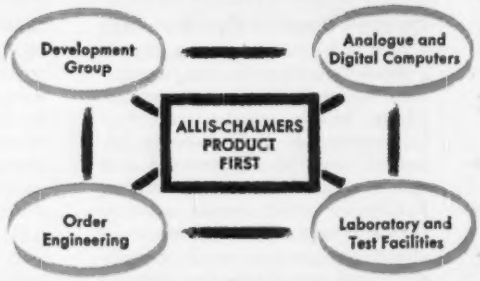
...from the company that put

Progress in Switchgear

For 113 years Allis-Chalmers has built a reputation for the finest products in the industry. A-C is continuously developing new ideas, new techniques and new products to serve you better. This same leadership spirit has quickened the pace of switchgear progress. It's responsible for the firsts illustrated above. These testify to one company's research and engineering *action*.

There are still better things to come in switchgear. You'll get them all when you specify better switchgear ... designed, built and *guaranteed* by **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin. A-1357

Aluma-Clad is an Allis-Chalmers trademark.



Intradepartment teamwork bridges all gaps ... smoothly integrates information, machines and men ... speeding overall progress in Allis-Chalmers switchgear.

Editorial Comment

JULY 4, 1960

Higher Service Voltage Goes On Trial

Higher service voltage will be put on trial this summer in a growing colony of all-electric homes. When this 240/480-v system picks up load, experience and field tests will begin to settle the arguments industry groups have voiced "in committee" these past five years.

Baltimore Gas & Electric Co's new installation would command attention in any circumstances. But following so closely upon the National Electrical Manufacturers Association's recent decision to "reject the recommendations in the Joint EEI-NEMA Preliminary Report on Higher Secondary and Utilization Voltages," it may prove epochal. For this rejected report stemmed from the utility industry's far-sighted effort to avoid future difficulties in system and appliance voltages.

Test installations have been too long delayed. But no previous development afforded the right combination of conditions for the trial. What was needed was a large-scale plan by a developer who was himself sold on all-electric homes in an area served by a utility that dared to pioneer. And it needed the close cooperation of a manufacturer with enough faith in higher utilization voltage to develop apparatus and appliances for it.

Sceptics may argue that special conditions made 240/480-v service feasible for these few luxury homes, conditions unlikely to recur elsewhere for some time. But earlier generations of sceptics scoffed at Edison's first lighting installation and others went to court to stop the Westinghouse ac system.

Time and tests will determine the true merits of higher residential-service voltage. But the industry will honor the utility, developer, and manufacturer who dared to bring it to trial.

EEI Develops Guideline Toward Workable Federal Policy

Edison Electric Institute's policy committee has presented the nation with the clear, forthright and reasonable guideline to a federal resources policy that has been needed for decades (EW, June 20, p 86).

We like the use of the expressions "non-federal" and "voluntary" capital. Embodied in these expressions is the philosophy that direct beneficiaries of river basin development, whether utilities, land or irrigation organizations, and whether publicly or investor-owned, will bear a fair share of the cost of the projects. At the same time the government is left with the control of a basic natural resource that it should have.

Absent from the policy is a clear statement turning increased land values and revenues from reclaimed land back to the government as reimbursement for flood control and irrigation costs in projects. Nor is there mention of possible revenues from navigation interests. Power is mentioned as the sole revenue producer, although there are many other direct beneficiaries from comprehensive river basin development.

As far as it goes, though, the EEI policy statement deserves the backing of the electrical utility industry and the attention of party policy authors. It is broad and at the same time sufficiently specific, and above all else it is positive. It shows a way for private and public power to exist together.

AEC Wants Enrico Fermi Rehearing

The Atomic Energy Commission —with the Department of Justice acting as its attorney—has petitioned the full District of Columbia Court of Appeals for a rehearing of the Court's June 10 decision by three of its judges setting aside AEC's construction permit for the Enrico Fermi fast breeder reactor.

AEC officials base their appeal on the belief that the decision of the three-man Court is so erroneous that the full bench should be given a chance to reverse the two judges who wrote the majority opinion.

Should the Court not agree to a rehearing, the Commission will then seek further review of the case by the Supreme Court.

Power Reactor Development Co (PRDC), the 21-firm organization made up mostly of electrical utilities with some equipment manufacturers sponsoring the Fermi Plant, joined AEC and Justice Department in filing a petition asking the court for a rehearing.

Loren K. Olson, newly appointed AEC commissioner who was general counsel for the Commission during the appeals trial, says that it's now impossible to understand the exact meaning of the Court's finding regarding safety of reactor sites. The Attorney General, moreover, agreed with Olson and the Commission, to elect the rehearing procedural approach as "the best way to disentangle major legal questions" involved in the decision.

Both Justice and AEC attorneys working on the case are hopeful that the Court will agree to a rehearing, and believe that a decision from the nine-man Court will come quickly, if they decide to turn down the AEC appeal. If the Court should accept the appeal, then a decision would seem likely by fall. This would still make possible an appeal by the loser—whether the unions or the AEC—to the US Supreme Court. If the Supreme Court should accept the case, then it would probably schedule arguments some time during the Oct. 1960-July 1961 term—and probably hand down a decision by a year from now, although cases are sometimes held over for the following term of the Court.

Rehearing Prevents Work Stoppage

One strategic point accomplished by the rehearing petition was to stay the Court's decision from being handed down to the Commission, allowing construction work on the reactor to continue. The project is now scheduled for completion in early 1961 and, regardless of the course of the AEC's appeal, PRDC is going to keep on with construction at its own risk.

No one has yet asked the courts for an injunction to stop the construction where it is. This gives room for speculation that one reason for the petition to the nine-man Appeals Court is to allow PRDC to complete the plant before the legal battle over AEC safety licensing procedures has been finally settled. If such should be the case, then it is likely that the unions would ask for an injunction to block operation of the plant until the legal issues are resolved, if AEC moved to issue an operating permit.

At the core of Judge Henry W. Edgerton and Judge David L. Bazelon's majority decision was their rejection of the Commission's two-phase licensing procedure—or issuing a conditional construction permit first and later a final operating license upon construction completion and the resolving of all safety problems associated with the particular reactor.

The majority opinion stated: "We think it clear from the Congressional concern for safety that Congress intended no reactor should, without compelling reasons, be located where it will expose so large a population to the possibility of a nuclear disaster."

Reply Brief on Stock Option Plan Filed by

The answer of Middle South Utilities Inc to proposed Securities and Exchange Commission staff findings (EW, May 30, p 27) about stock options is:

"The chamber of stock option horrors presented in the proposed findings of the (SEC) staff must be recognized as a vastly overdrawn caricature, even by the most vehement opponents of stock options."

Middle South wants to institute a stock option plan to help attract and hold executives, and the SEC staff is challenging the proposal.

Stating that Congress made it possible for all corporations to have restricted stock option plans in Section 421 of the Internal Revenue Code of 1954, Middle South is charging that SEC is basing its main arguments on Section 18 (d) of the Investment Company Act of 1940. The earlier act prohibits stock option plans. The Internal Revenue Code does not say they are wrong, nor does the Public Utility Holding Act of 1935.

Middle South's answer to the SEC staff opinion that a stock option might mislead an investor as to the potential book value and earnings of his stock is a question: "Is this commission willing to say in effect that Congress authorized or even sanctioned such misleading of investors in enacting the Internal Revenue Code?"

SEC says that Section 7 (d) (6) of the Holding Company Act does not permit restricted stock options because the difference between market price and the exercise price of the option is a dilution that is wrongful and inequitable to the interests of investors and consumers. The reservation of 120,000 shares that Middle South wants to make represents less than three-fourths of 1% of the 16,750,000 outstanding common shares, and under the plan no single employee could get more than 6/100 of 1% of the shares.

In the infighting between Middle South and the SEC staff the language is informal and sharply critical. An example from the reply brief is:

But to this reasoning, Olson asks, "What do compelling reasons mean? Or when is a reactor too near or not near enough to a large population?" He pointed out that the Fermi reactor is 30 miles from Detroit's two-million population.

Meanwhile, utilities with atomic power plants under construction or waiting for issuance of construction permits were beginning to react to the Court's decision.

Comments of utility leaders: Elmer L. Lindseth, president, Cleveland Electric Illuminating Co—"The Commission's split licensing procedures have always been a problem. Under them a company can lose millions. The Court's decision seems a little too harsh."

Allen S. King, president Northern States Power—"Even though we have our construction permit it was conditioned on our research and development proving out; and this depends a lot on who's judging the research and development. There's also a lot of risk in the Commission's two part licensing procedure."

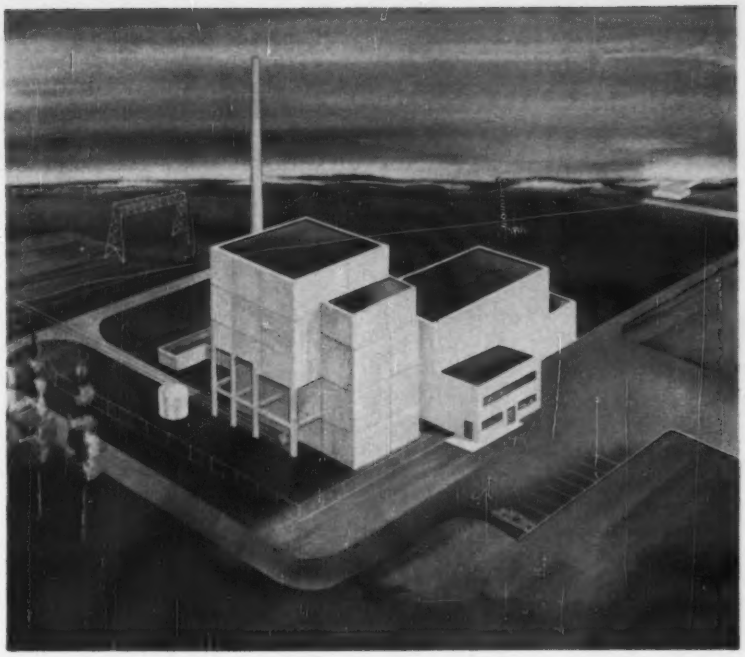
Jack Horton, president, Southern California Edison Co—"I can't make an unqualified statement until our lawyers thoroughly study the decision. I don't believe the decision will have any present effect on our negotiations with Westinghouse to build a full-scale atomic powerplant.

"But I may feel differently after I study the decision," he added.

Middle South

"The extent to which the staff is driven to make its extreme case is illustrated by its point F: 'The Internal Revenue Code did not amend the Holding Company Act.' Who ever contended that it did? This windmill tilting illustrates the basic fallacy in much of the staff's argument. It assumes that the Act contains a clear prohibition: Thou shalt not issue restricted stock options—as Section 18 (d) of the Investment Company Act of 1940 does. The most that either the staff or we can present to the Commission is a problem of interpreting the act."

Middle South is awaiting the SEC answer to the reply brief before deciding whether to go to court.



L.A.—Pasadena A-Plant Approved

A joint proposal by the cities of Los Angeles and Pasadena, Calif., to build a 50,000-kw improved cycle boiling water reactor has been approved by the Atomic Energy Commission.

The proposal was selected by AEC over the only other submitted in response to a Commission invitation—one by the Western Farmers Electric Cooperative, Anadarko, Okla.

Both proposals were in reply to AEC's invitation last December to public power groups to construct a prototype BWR under the second round of the government's Nuclear Cooperative Power Demonstration Program. Under second round ground rules, the municipalities will operate the reactor and provide a site for the atomic power plant and conventional turbogenerating equipment. AEC will procure and own the nuclear portion of the plant.

Steps have also been taken by AEC to secure the reactor under a $12.5-million fixed price contract from General Electric Co. Under current construction timetables, the advanced type BWR should be completed by mid-1963.

Site of the proposed nuclear plant is an 1,100-acre tract 25 miles northwest of Los Angeles, near the town of Saugus.

Ivan Bateman, chief electrical engineer of Los Angeles Department of Water & Power, gave as a reason for the large site the long range plans of the city to install up to one-million kw on the property. The 50,000-kw BWR would just be a first unit. The plan is, according to Bateman, to follow with 250-350-kw nuclear units later on. "Los Angeles now has a 2.3 million installed kw system, and its power requirements are doubling roughly every 8-10 years," Bateman says.

Two Cities Are Interconnected

Plans are for Pasadena to take half the reactor's 50,000-kw capacity and Los Angeles the other half. The two cities have an interconnected grid, and power from the reactor will probably be fed into the Los Angeles system first, according to Bateman, before power is transmitted to Pasadena, because transmission costs can be saved this way.

Each municipality will put up $5-million. In addition, Los Angeles will provide the site and finance the conventional non-nuclear construction costs of the project.

House Unit Okays Burns Creek

The Burns Creek project finally was approved last week by the House Interior Subcommittee on Reclamation, moving toward a photo-finish showdown for approval by the House of Representatives before adjournment.

The Subcommittee, by an unrecorded voice vote, approved the controversial federal project last week—sending it to the full committee—after the bill (S-281) had been pending before the Subcommittee since last summer. The Senate had approved the Burns Creek Authorization Bill during its 1959 session.

Subcommittee hearings were held in February (EW, Feb. 22, p 22), and the bill was debated for at least eight hours in a series of closed sessions, starting in March and culminating last week. A favorable vote had been expected earlier this year, but the possibility grew this spring that the measure might be bottled up in the Subcommittee, instead. A final drive for approval put it over the top in June.

Some of the project's Democratic supporters reportedly felt that the measure might have serious repercussions against the Republicans, if it wasn't approved this year, and they apparently were willing to let it ride until next year for that reason. The Eisenhower Administration has supported the measure, although conservative Republicans fought it down the line.

Controversy Dwarfs Project

The size of the Burns Creek project is outclassed by the major controversy that hinges on it. The project would have a 90,000-kw generating capacity, cost about $50 million (including incidental expenses), and would have a storage capacity of 234,000 acre-feet. It would be located on the Snake River, Ida., downstream from the Palisades project, as a river regulating dam for Palisades.

The bitterest feature of Burns Creek for private power supporters is that the measure is guised as a reclamation project when only 1.7% of its costs would be allocated to irrigation. About 98% of the project would be allocated to power. Power companies had testified that an equivalent steam generating plant could be built for a fraction of the cost, as could a simple river regulating dam without power.

Public power supporters said that Burns Creek—although economically unfeasible on its own feet—was feasible when considered with Palisades; and it was planned originally as a part of the Palisades project.

Rate Meeting Set by PUC

After starting off its investigations with a "toe in the water to see how cold it is" attitude, the Pennsylvania Public Utilities Commission has waded right into Philadelphia Electric Co. Last week the PUC gave utility men across the country an idea of what they may expect from their own local regulatory bodies.

The PUC said that it's presently preparing an investigation of Philadelphia Electric and Pennsylvania Power & Light Co, the state's two biggest electric power utilities. It aims to determine whether the companies' rates should be lowered.

The PUC directed the firms, with combined gross annual operating revenues of $353,368,000, to meet with commission members for a preliminary inquiry discussion within 30 days. The 30 days will run out around the middle of July.

Continuing studies of quarterly reports filed by the companies—serving a wide, heavily industrialized area—showed that both may be "over the line" in earnings on the basis of indicated plant fair value, the PUC stated.

The commission last month ordered a check into earnings of nine other electric power firms, including Duquesne Light Co and Metropolitan Edison Co. "At that time, a review of Philadelphia Electric and PP&L operations did not indicate excessive returns," the PUC said. "Further analyses now make it appear that their earnings may be too high," a spokesman now adds.

The conferences with the utilities are aimed at determining whether immediate reductions should be made or formal public hearings opened to establish fairness of rates.

One small company already has agreed to reduce rates since the present PUC checkup began. It's the Harvey's Lake Light Co, of Luzerne County, which cut charges $25,990 yearly for 3,429 customers following conferences with the commission's rates staff.

Other firms under study are: West Penn Power Co, Greensburg; Pennsylvania Power Co, New Castle; South Penn Power Co, Waynesboro; Pennsylvania Electric Co, Johnstown; Cumberland Valley Electric Co, Mercersburg; and Waterford Electric Co, Waterford.

Grand Jury Indictments Hit More Manufacturers

Indictments against manufacturers of steam turbine generators and condensers were handed down by a Philadelphia Grand Jury.

General Electric Co, Westinghouse Electric Corp, and Allis-Chalmers Mfg Co and four individuals are accused of giving each other "position" in bidding on several major steam turbine generators, including those for nuclear power plants being built by Consolidated Edison Co, Commonwealth Edison Co, and Detroit Edison Co. Named as co-conspirators but not defendants are Carrier Corp (Syracuse, N. Y.), DeLaval Corp, and Worthington Corp. These companies are said to do an aggregate of about $400 million in steam turbine generator business annually.

Seven manufacturers and three individuals are named in the condenser indictments. The companies are: Foster Wheeler Corp, Allis-Chalmers, Carrier Corp, Ingersoll-Rand, Westinghouse, Worthington, and C. H. Wheeler Mfg Co. They are charged with bid rigging and establishing basic prices of specific condenser jobs.

H. E. BROWN, Commonwealth Edison Co, uses Chrysler Corp's IBM 709

EEI Computer Task Force Formed

EEI's Task Force on Computer Applications For Utility Engineering at its first meeting in Detroit on June 2-3 established an organization framework, set up objectives and explored areas of activities for six working groups. In opening the meeting, L. W. Coombe of the Detroit Edison Co said that task force participants will be representatives of: EEI member companies, computer manufacturers and colleges and universities. Cost of the activities, said Coombe, will be allocated, including value of manpower, computer time for debugging and travel cost.

Objectives of the group, it was announced, include stimulation of the use of computers for engineering studies and the exchange of information on programming and other computer work. The task force plans to publicize: completed programs; programs contemplated; problems of interest; write ups available, and bibliographies.

No company has been able to advance its computer work in all fields as rapidly as it would like, said G. W. Stagg, American Electric Power Service Corp. Setting up of the task force establishes a working arrangement. By combining resources the group can form a major industry effort that will return many dividends.

Workshop on Electrical Problems

D. D. Williams, Baltimore Gas & Electric Co, said the group's plans are to contribute to anyone who will make the result of his efforts equally available.

In the workshop meeting, H. E. Brown, Commonwealth Edison Co, describing a matrix method of solving short circuit problems, said this method works better than the iteration method because it is possible to get a complete history of the power system network straight through the solution. There is no matrix inversion with this method. He said the solution of an 83-bus problem required only 30 minutes.

Costs of making load flow studies have been reduced drastically as faster computers have become available, G. W. Stagg told the workshop group. Discussing load flow studies on a 32-bus, 42-line system, Stagg said that the cost was $35 per case for the first study which was made on an IBM 650 computer. Later studies run on an IBM 704 computer cost only $3 per case and the latest study, which was made on an IBM 7090 computer, cost only $1 per case.

Mechanical Problems Work Shop

Stability studies can be made on the 704 computer at dollar savings of four-to-one when compared to analyzer study costs, said S. J. Zuckernick, General Public Utilities system. Manpower savings for the same studies are in the order of 25-to-1. The computer has permitted stability problem studies that could not have been handled on a network analyzer.

Highly complicated pipe flexibility problems can be solved with the computer, said W. H. Beck, Baltimore Gas & Electric Co. The computer permits consideration of many factors and many analyses, resulting in less-liberal designs and subsequent large savings in construction costs. Other benefits include reduced heat losses and pressure drops.

Working Groups Meet

Reporting on a joint project with Detroit Edison Co on automatic structure design, D. D. Williams, Baltimore G&E, said this second generation program is being written for an IBM 704 computer but will also be assembled for other computers. The program permits the design of whole floors of beams at a time; columns between floors also can be designed a whole floor at a time. Design for a building can be processed in one pass through the computer.

The network analysis group set up a 7070 team; a USS 80 team and a 1401 team. The 7070 team, headed by D. D. Williams of Baltimore, will develop programs for load flow, short circuit, and stability studies. The group will meet under IBM sponsorship in Chicago this fall. The USS 80 team, devoted to network analysis research, aims to have a computer tied to the system for running load flow problems.

Seven study possibilities have been listed by the distribution planning group, with priority on system planning.

DAN BRAYMER IN EUROPE—IV

West German Firms Plan Test

Frankfurt, Germany—Western Germany may soon have another high-capacity short-circuit testing center like those at or near Kema, Holland, Milan, Italy, and Paris, France.

The "Big Four" German electric manufacturers (Allgemeine Elektrizitaets-Gesellschaft [AEG], Siemens Schuckertwerke, Voight & Haeffner, and Calor-Emag) have signed an agreement under which they can give certificates of test for switchgear short-circuit tests conducted in each other's laboratories.

The agreement will permit the partners to use each other's test facilities and have tests witnessed by at least one other member of the partnership besides the maker of the equipment under test. This preliminary step toward a central cooperative laboratory has been discussed for over a year.

German apparatus and switchgear manufacturers do not wish to see their German customers turning any longer to central test facilities in other countries. German utilities and their power transformer suppliers are coming to grips with the problem of transformer noise, as distribution substations move into residential areas, and the customers become conscious of the substations' presence. Enclosures and double tanks are among measures used.

EHV switchgear with an interrupting rating of 20,000 Mva is beginning to appear on Western European power systems. An order for 20 pieces of 20,000 Mva air blast switchgear by one major system was split between AEG and BBC (Brown Boveri Co). Apparatus manufacturers say they are prepared to deliver ratings up to 25,000 Mva.

Prices of electrical apparatus from the German Big Four and German Brown Boveri are not going up. Production capacity of apparatus manufacturers is still too high compared with the level of orders. In spite of this, German firms are not anxious to export. The seeming paradox is explained by a shortage of labor. There is apparently plenty of space and of equipment in German apparatus factories, but not enough manpower to run the machines.

One major manufacturer told me that about 20% of his company's productive capacity is available for export; 80% occupied by domestic business in Germany. This same manufacturer estimated that the apparatus industry in Germany, as a whole, had about 18% excess production capacity available for export.

A major manufacturer conceded that his company expected to lose some business to Scandinavian or English firms and was losing business to Japanese and Italian manufacturers on the basis of the wage differential. Wages in Germany have been going up, I was told, about 5 to 7% per year. But the productivity of the factories has kept pace with the increase, so that prices have remained fairly constant.

To the German electrical manufacturers with diversified lines, including electrical appliances, the increase in German wage levels is looked on as a good thing, as the consumer goods industry keeps pace with the increase in wages. Consequently, the German manufacturers are profiting and do not find them-

Top Utility Engineers Open CIGRE Meeting

Electric utility engineers from around the world are meeting in Paris to discuss the problems of keeping power systems in step with economic and industrial expansion, and with growing customer requirements. These engineers, the elite of their profession, are attending the 18th biennial Congress of the Conference on Large Electric Systems (CIGRE), oldest and largest of the international electrotechnical organizations, embracing some 50 nations.

G. Silva, president of CIGRE, in his opening address to the 1,500 delegates, said that such periodic rendezvous among engineers is responsible in large measure for the rapid spread of large power plants and high voltage transmission grids of the world today, as well as the swift progress of the electrical industry everywhere.

CIGRE PRESIDENT G. Silva cites conference as responsible for technology advance

Technical sessions of CIGRE began with all-day conferences on system-planning, stability problems and insulation. Other sessions dealt with dc transmission and with lightning protection problems. Delegates will also consider progress in EHV transmission and in high voltage cable practice.

The US delegation to CIGRE, headed by Philip Sporn, American Electric Power Co, numbers 50 and will present eight of the 132 papers of the conference. Early sessions devoted to system stability and light-

Laboratory

selves in essential conflict with the rising wage trend. It is surprising and interesting to find German apparatus manufacturers, like those in the US, worrying about cyclical buying by domestic utilities. In Germany, it's a two-year cycle, but its origins and manifestations otherwise parallel the well-known five-year buying cycle in the US.

Last year the German Big Four had a "bad year." For the first time since World War II, orders were reduced to a new minimum. Then, about the turn of the year, orders turned up just in time to avoid a cut back in production. Up to 1959, the effect of the two-year German buying cycle has been restricted simply to a lengthening and shortening of apparatus delivery times.

The first water-cooled generator stators are now in fabrication and undergoing tests by one major German electrical manufacturer, but I could not find out whether an order had been placed for such a unit. Presumably it had, otherwise it would not be likely that such a machine would be in manufacture even in a prototype size.

Bonn, Germany—About 30 miles of 110-kv cable with corrugated aluminum sheath and PVC jackets bonded to the sheath have been sold since 1956 to Western European utilities. Most of this mileage has been in short lengths, generally less than a mile. This cable is mostly the oil-filled, paper-insulated type. The first 110-kv aluminum cable was installed by a West Berlin utility in 1956.

Until August, 1959, most of this cable was delivered with the plastic bonded directly to the aluminum sheath. Now, however, by agreement among the aluminum sheath cable manufacturers, a second corrosion-resistance coating of alternate layers of bituminous compound and polyethylene tapes 0.295 in. (7.5 mm) thick is being added between the jacket and the aluminum sheath.

Need for the barrier apparently grew out of corrosion and electrolysis on aluminum cables fabricated some three years ago by techniques now considered obsolete. German cable makers believe that it will take about a year before new production machines will provide 100% bonding between aluminum sheath and PVC jackets. The bituminous barrier is adding 5 to 8% to the cable price and putting a substantial premium on development work on machines for extruding aluminum sheath over the cable core and applying the bonding and the PVC jacket in a single process.

Designs for a 380-kv single-core, lead-sheath cable have been in existence in Germany since 1954. About a month ago Rheinisch-Westfaelisches Elekrizitaetswerk (RWE) took bids from European cable makers for a 380-kv cable of ⅝ of a mile (1 km) to be installed in one or two years. At least one design submitted involves use of corrugated aluminum sheath, grounded. In this instance the single cable is of a pressure-resistant type using paper and oil at 15 atmospheres (225 psi).

Synthetic Cable Tapes Studied

Among German cable makers research is going forward on the use of synthetic cable tapes as a substitute for paper. But, there have been no major breakthroughs to date. European cable makers believe that it is feasible to extrude synthetic insulation on copper conductors for use at 110 kv. The production problem apparently turns on ability to extrude polyethylene clean and bubble-free and with a good junction between the polyethylene and the copper conductor.

in Paris

ning have been marked by vigorous US discussion bearing on the automatic features of system operation and the tie-line load control.

Interest at a session on dc transmission centered on experience with Swedish and Russian high voltage dc transmission lines. Discussion covered better than five years' operation in each case. Details of the projected dc submarine cable under the English Channel were revealed and preliminary test results on terminal apparatus presented.

It was disclosed that France is considering the installation of a dc cable under the Mediterranean from Africa to carry power from gas burning power plants into southern Europe, as an alternative to a submarine natural gas pipeline. An Italy to Yugoslavia dc link is also in discussion.

World Power Conference Attracts 2,000

More than 2,000 engineers from 60 countries were on hand for the beginning of the sectional meeting of the World Power Conference in Madrid June 5. Welcoming the delegates was Spain's Public Works Minister, Jorge Vigon, who spoke in the name of Generalissimo Franco.

Theme of the meeting was the solution of power shortage problems, and in Spain this is an appropriate subject because of the country's need for more power.

Juan Antonia Suanzes, president of Spain's National Committee, demonstrated how electrical energy has played an important role in Spain's evolution and recuperation.

Speaking for the 60-man US delegation, Francis Adams of the Federal Power Commission said no other single factor had contributed so much as the development of power to the progress of mankind. He said: "The great progress that has been made during the past 30 years in the development of electric power is shown by the six-fold increase in the world's production of electric energy—from 287 billion kwhr in 1930 to about 2 trillion.

"Unfortunately, however, the greater portion of this energy production is concentrated in only a few of the more highly industrialized countries. Of the 58 member nations of the World Power Conference, 10 nations with only 25% of the world's population now account for nearly 80% of the world's electric energy. If all nations are to have the comforts and advantages of 20th century civilization now available, there must be found a means of putting their potential energy resources to work," he said.

Economical Peaking Capacity

Selection hinges on costs for particular system's load magnitude and duration and system's geographical locus and climate

TOR KOLFLAT, Mechanical Engineer, Sargent & Lundy, Consulting Engineers, Chicago, Ill.

Peaking capacity may be obtained by several methods, each meriting examination to determine the most economical. Relative costs per kw for the several methods can be checked as in Fig 1 from the initial studies.

The magnitude, location, and duration, as well as the frequency of the peak load, should be carefully reviewed in comparing ways of meeting peaking requirements. Power purchase from a neighboring utility under a pool arrangement may in some cases offer economical peaking capacity. Other cases may be solved by utilizing marginal capacity in existing units.

In conventional steam turbine unit power plants, there is a considerable decrease in incremental cost for an increase in size of a given unit. Such increment capacity will have an efficiency comparable with that provided as base capacity. In the design stage the incremental cost of the conventional steam-turbine plant can be further reduced for peaking operation.

Available at Low Cost

A comparison of installed costs for various types of capacity indicates that for steam plants in the design stage as much as 10 to 20% short-time peak capacity can be obtained at a comparatively low cost.

In evaluating cost and other factors of different types of peaking capacity, the magnitude of peaking requirements in relation to normal load and unit size must be established. Expected annual, seasonal, and daily operating hours of the peaking capacity must be considered. This is done by analyzing the system's daily peak load curve, which shows the percentage of time the different percentages of system peak load occur.

Peak magnitude and duration vary considerably on systems in different parts of the country. Load factor on Northern systems ranges around 60%; that on Southern systems about 50%. As the few hours of peak load occurrence are actually scattered over much of the year, the load duration curve must be interpreted correctly. Peak generation capacity for a small percentage of time must be actually available and operating much longer.

The theoretical and actual loading of units on a Southern system are compared in Fig 2. In the South, where summer peaks exceed those of cooler months by 30%, the seasonal peak is of special interest. Although the nature and magnitude of the peak load differs with systems, it is generally accepted that the peak portion occurs less than about 1,000 hr and represents about 10% of the total system load. Yet that peak portion may be 30% of the total.

What, then, is the most economical way of serving such peak loads?

Margins Incorporated

Major power plant equipment incorporates various design and manufacturing margins. After equipment has been placed in operation, additional capacity is sometimes available by virtue of these margins. A test program can determine such available peak capacity.

In such tests, operating problems as well as equipment performance should be analyzed, with the participation of the equipment manufacturer, to establish a reasonable short-time peak capacity as distinct from continuous maximum load limits. The tests could reveal that certain specific pieces of equipment constitute the limitation, and that the limitation could be extended at an expense small compared with the value of the extra capacity. Instances are many of such uprating equipment after installation.

The manufacturer will not always support such peak uprating, as it reduces the margin built into his equipment. When the tests are thorough and detailed, however, he is often willing to give a substantiated opinion on the risk involved in such occasional overloading. Nevertheless, the different failures actually occurring in power plant equipment should serve as a warning that, despite all calculations, a zone of uncertainty remains, and the owner must accept the risk.

Unit size, fuel, throttle steam conditions, type of cycle and equipment affect total plant cost. The cost of incremental capacity through the installation of larger units is 20 to 30% less than the average cost of a conventional steam power plant. Thus, it might be well to review the merit of peak capacity as an increase in the size of contemplated units, instead of in separate peak units.

The relationship of incremental to average cost of typical steam plants is illustrated in Fig 3, in which the total construction cost of adding 50, 100, and

Low Efficiency Steam Cycle Cuts Cost per Kw of Conventional Plant

Size of Unit, Mw	100	100
Type of Unit	Reheat Regenerative	Nonreheat Nonregenerative
Throttle Pressure, psig	1,800	850
Throttle Temperature	1,000F	900F
Reheat Temperature	1,000F	———
Condenser Vacuum, in. Hg	3½	3½
Plant Heat Rate, Btu/kwhr	10,171	13,319
Feed-Water Heaters	5	1
Boiler Design, lb/hr	700,000	910,000
1. Turbine Generator and Accessories	$ Base	$— 6.86
2. Condensing Equipment	$ Base	$— 0.33
3. Circulating Water Supply Structures	$ Base	$+ 0.77
4. Boiler and Boiler Plant Equipment	$ Base	$— 8.79
5. Feed Water System	$ Base	$— 4.68
6. Piping, Gauge Boards, Instruments, etc.	$ Base	$— 3.11
Total Savings	$ Base	$—23.00

Obtainable in Many Ways

125-Mw units to typical coal and gas, or oil, fired stations has been plotted. Identical steam conditions of 1,450 psi, 1,000F/1,000F equipment have been posited for each curve. The only variable affecting cost is the unit size. A similar plot can be made for other unit sizes.

With reference to Fig 3, assuming a 20% increase in the size of the oil-fired unit from 100 to 120 Mw, the cost of the additional 20 Mw is in the order of $80 per kw, compared to the average cost of $107 per kw for the 100-Mw plant. Thus there is a considerable decrease in incremental cost for the increase in size of a particular unit. This increment could be considered peak capacity, and it is of the same quality and efficiency as the base capacity.

Sacrifices Pay Off

Where much peak capacity is needed for only three to four months and can be shut down the rest of the year, it appears to be economical to design low-cost, low-efficiency units, sacrificing stack temperature, feed water heating, vacuum, and other features. A study for a 100-Mw gas or oil-fired unit, Fig 4, indicates about 20% saving in capital cost over the efficient unit of the same size.

Part of the cost reduction is obtained by using a non-reheat, non-regenerative turbine cycle having 850-psi and 900F throttle conditions instead of a reheat regenerative, 1,800-psi, 1,000F/1,000F cycle. The boiler's stack temperature was designed for 500F instead of 300F. Condenser surface was reduced, and only equipment essential for carrying the load was included, the absence of spare auxiliaries contributing to the lower installed cost. With the 1,800-psi, 1,000F/1,000F unit as a base, a breakdown of the estimated total cost reduction of $23 per kw is shown in table.

Put Peak Capacity in Designs

For steam plants in the design stage, short-time peak capacity can be provided at a cost substantially below both the average normal and incremental capacity cost. For example, output of a turbine can be increased without increasing the throttle flow, by reducing the steam extracted for feed water heating. This is done by omitting one or more top heaters from service. In a five-to-six heater cycle, the increase in turbine capacity is about 4 to 5% for one heater. When two top heaters are out, the overall increase in theoretical capacity is about 7 to 9%. But part of this is lost due to loss in efficiency.

Taking feed-water heaters out of service during peak periods has some minor effect on turbine reliability: It increases steam flow through the tail end of the turbine which, under high-vacuum conditions, may put heavy stress on turbine blades.

Removal of each feed-water heater from service brings down the feed-water temperature about 60F. This affects boiler performance by increasing the steam temperature, as more fuel must be burned for the same steam flow to compensate for the lower feed-water temperature. The higher steam temperature

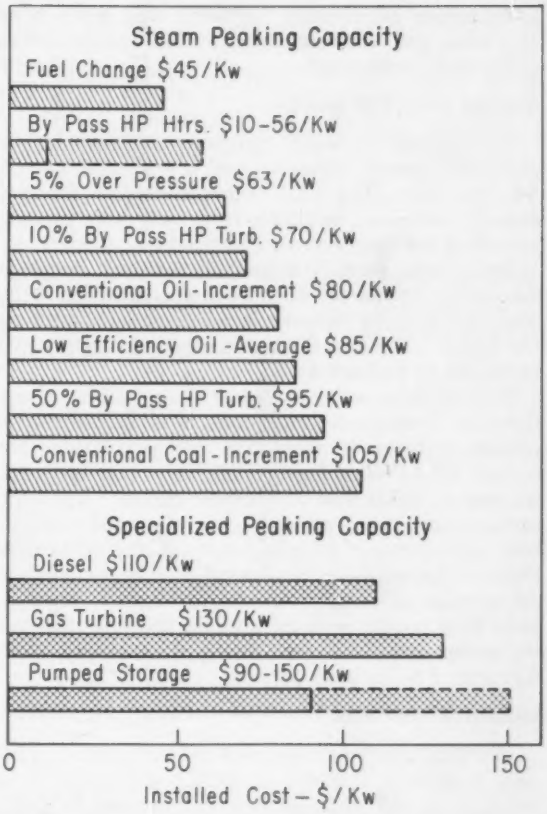


FIG 1—PEAKING CAPACITY COSTS vary with the way it is obtained, various methods of getting it being shown

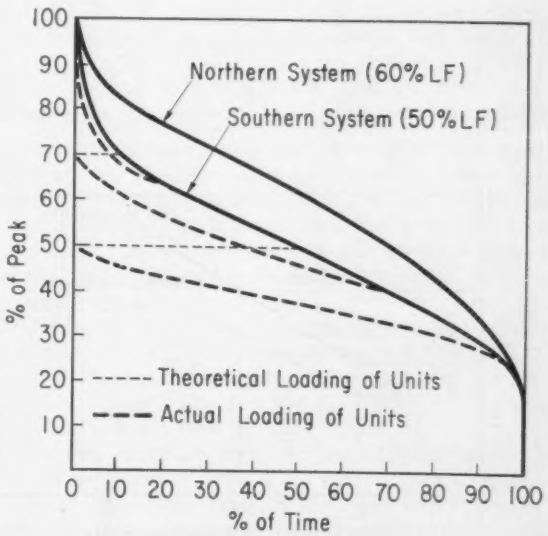


FIG 2—LOAD DURATION varies with operating areas and actual loading of units differs from the theoretical

requires more high-temperature super-heater-tube material and more desuperheating for operation over a lengthy period. Total heat input to the boiler also grows in proportion to the load. If the peak load is to be carried occasionally for longer than a few hours at a time, the fuel being coal, an increase in furnace size may be necessary.

May Be Only $10 per Kw

An increase in boiler equipment capacity for the prolonged period represents an incremental cost of $44 per kw. The total incremental cost for such capacity increase, including more generator capacity and other outlays, is about $56 per kw.

For shorter peak operation, the existing margin in the boiler equipment may be used, provision being made for only an increase in auxiliary equipment for the boiler. The cost of this incremental capacity may be as low as $10 per kw.

Due to the leeway established in the turbine manufacturers' pressure specification, it is permissible to operate turbines at about 5% higher pressure than normal for a limited time. This makes possible a 5% increase in steam flow and turbine output. The usual turbine-generator contract does not concede that an increase in output is permissible, as the permissible pressure fluctuation is not intended to be followed by an increase in steam flow. Some turbines, however, have been bought with the specific understanding that the steam flow, and consequently the capacity, could be raised 5% for peak periods.

Bypassing Discussed

In trying to evaluate the cost of peak capacity from such a pressure increase, it again requires 5% more boiler equipment capacity and 5% increase in generator capacity. The total equipment increment cost on this basis might be about $63 per kw without making use of available equipment margins.

The capacity of a given turbine can be increased by partly bypassing the front end and admitting considerably more steam to its lower stages. A 10% increase in steam flow is almost in the same classification as a pressure increase, except that it further reduces the turbine efficiency and, therefore, theoretically requires additional boiler capacity. Therefore, the incremental equipment cost might be in the order of $70 per kw.

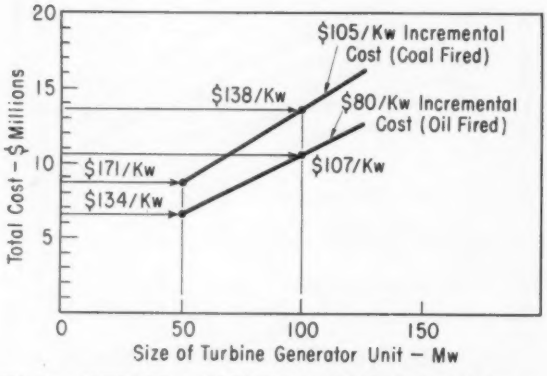


FIG 3—AVERAGE INCREMENTAL COST PER KW for increasing unit size to obtain more peaking capacity is low

Recent studies of at least one turbine manufacturer contemplate as much as 50% increase in capacity of a turbine by bypassing its front end. A flow diagram showing both normal and bypass operation is shown in Fig 4. The width of the bands indicate the relative magnitude of flow.

In this instance, the problem becomes somewhat different than in bypassing only 10%, because the turbine efficiency decreases about 10% at full load, which then requires 10% of full boiler equipment capacity in addition to the straight increase in loading. For instance, as the turbine capacity is raised from 200 to 300 Mw by this method, the actual increase in overall boiler equipment capacity must be in the order of 130 Mw. It also imposes flow rates through the lower part of the turbine which, up to now, have been considered excessive.

Capital Incremental Costs Differ

Such a high percentage of equipment peak capacity requires different capital incremental cost, partly depending on the contemplated duration of the overload. If it is to be used only 2 or 3 hr a day on peak days, it does not substantially increase the daily output and does not require more coal and ash-handling equipment. No more condenser and circulating equipment and no bigger feed-water heater will be required, as no effort is made to maintain high efficiency during such conditions. Larger boiler and boiler auxiliaries and piping, and some boiler room building space will be required, particularly when coal is the fuel, because slagging and related boiler problems must be considered.

The cost of enlarging boiler-room capacity would be about $45 per kw, but due to the loss of turbine efficiency, actually $45 \times 1.3 = \$60$ per kw will be required. The uprating of turbine-generator equipment, as well as related electrical items, amounts to about $35 per kw. On this basis, the total increment cost of the increased 100-Mw, or 50% increase of a 200-Mw unit, would approximate $95 per kw, with the understanding that the high overload is only for short periods.

This 50% increase in unit peak capacity is not materially different in cost, whether it is accomplished by bypassing the high-pressure turbine or by using a bigger standard turbine. In the latter instance a saving in boiler capacity probably compensates for the outlay for a larger standard turbine.

There is a difference of $35 to $40 per kw in plant cost between gas firing and coal firing. This is due partly to the larger boiler equipment for coal firing. When a unit is designed for coal burning, it is possible, with a small increase in capital cost, to arrange for gas or oil firing for greater output during peak hours and thus increase the capacity of the boiler. But proper adjustment must be made in the original design.

The cost of such incremental peak capacity depends entirely on how it is accomplished and will cost less if obtained by partly bypassing high-draft equipment. An increase of 20% more in boiler capacity can be obtained by a change in fuel at a cost of $15 per kw when the main boiler's size is not changed. The turbine-generator peak capacity could be obtained for

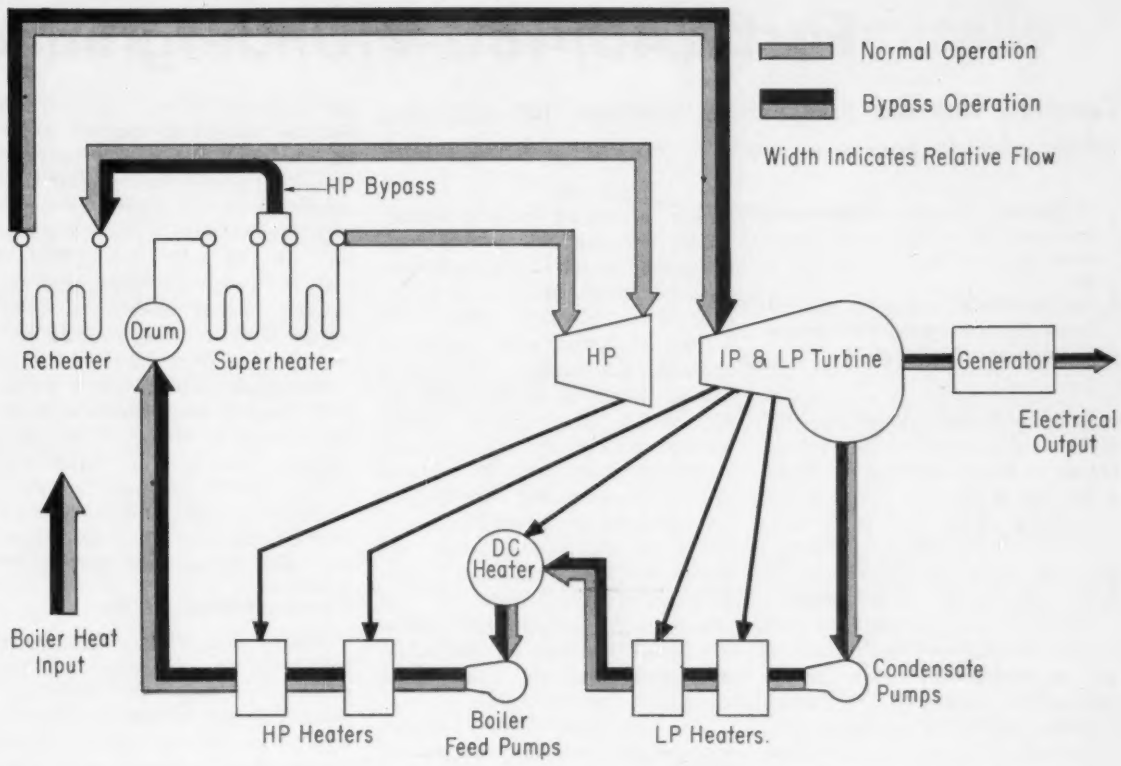


FIG 4—50% MORE CAPACITY is obtained through bypassing turbine's front end, sacrificing 10% efficiency

$30 per kw, or a total of $45 per kw for the plant increment cost. Fuel cost would be higher when oil or gas is burned, and the operating hours at such load condition would determine the breakeven point.

Only steam-turbine generator units have been considered so far. From a management viewpoint, there are considerations besides first cost connected with the integration of a fundamentally different type of specialized capacity into the system. These include the comparative capacity longevity, established reliability, maintenance, personal experience, and commercial aspects.

Hydro Considered

Pumped storage has been considered for locations where water could be pumped to an elevated pond by spare steam capacity at night and used for generating during day peak hours. The only capital gain would occur, where location is well suited to inexpensive water storage. The hydroelectric and associated power equipment, installed in the plant proper, would cost at least $90 per kw. The penstock, storage facilities, and items outside the plant proper, usually bring the cost to $150 kw or more.

This peak capacity does not really add prime generating capacity, but is more in the class of a storage battery. When the pumping at night is limited to 8 hr, the plant only runs at full load for about 5 hr during the day, as there is considerable loss in efficiency due to pumping power. Thus 3 kwhr of steam capacity have to be used to obtain 2 kwhr of hydro power.

Gas turbine-generator units, available up to about 25-Mw rating, are of the simple-cycle type operating at 3,600 rpm.

The capability rating, as well as the efficiency of a gas turbine of this type, depends on the inlet air temperature. As an illustration of the magnitude of this temperature effect, if the inlet air temperature is increased from 40 to 80F, the capacity is reduced 17 to 18%. Total estimated construction cost, including oil storage tank, is $130 per kw, based on a summer temperature rating for a one-unit plant.

Internal combustion engine units on the market are capable of providing 2,000 kw at 4,160 v for supplementary use in conjunction with a utility power system. The engines operate on diesel oil. A typical plant consisting of three generator units, each with a nominal rating of 2,000 kw, and one electrical control station can be placed on a plot measuring 42 by 54 ft overall.

The installation has one output connection, and one input signal is required to operate the three units. Each unit of the plant is base mounted with a weather-protective enclosure and has the possibility of obtaining full-load output within 90 secs.

For this 6,000-kw plant, the manufacturer estimates an installed cost of about $100 per kw with a replacement charge of one third the first cost after 15 years' service. Taking the present worth of this replacement cost to the time of purchase and considering installation requirements, the complete cost will be about $110 per kw.

First 240/480-V Underground

Competes with the conventional overhead for supplying totally electric houses in modern Maryland development

L. G. SMITH, General Superintendent, Engineer & Construction, Baltimore Gas & Electric Co, Baltimore, Md.

R. F. LAWRENCE, Manager, Distribution Engineering, Westinghouse Electric Corp, Pittsburgh, Pa.

A developmental project of 240/480-v underground distribution for homes is being installed by Baltimore Gas & Electric Co at a cost competitive with that of a conventional overhead system. The system will have direct-buried cable from pad-mounted transformers.

Westinghouse Electric Corp will furnish transformers and meters, as well as heat pumps and major appliances for use at 240 v to ground. Lighting and 120-v appliances will be supplied through an autotransformer in each of the new houses.

The residential development, Kingswood by the Severn, will comprise 72 houses initially. But ultimate plans envision about 500 houses, a country club, a marina, and associated facilities. It is about 3 miles northwest of Annapolis on the Severn River in a heavily wooded, hilly terrain which the developer plans to retain. Table I summarizes the connected loads in each home and the maximum 30-min demands of the various loads and groups of loads. Maximum 30-min demands, and the demands at 7 am and 6 pm are included. Maximum diversified demand on the autotransformer probably is very little more than that for 6 pm.

The heat pump deserves special consideration, not only because of the magnitude of its load, but also because its in-rush current is the basis of any lamp flicker analysis. It is a self-contained, air-to-air unit, consisting of two 2½-hp compressors, two ½-hp condenser-fan motors, a ¾-hp evaporator-fan motor, and 18 kw of supplementary resistance heating inserted in 6-kw steps. Lock-rotor and running currents are based on the rated 230 v.

Maximum demand of a single heat pump is based on an outdoor temperature of 0F dry bulb and a structure heat loss of 75,000 Btu per hr. Maximum ½-hr demand is estimated as the connected load of two compressors, associated fans, and 18-kw of resistance heating.

Primary Voltage 13 Kv

Kingswood's primary voltage will be 13 kv, in accordance with the utility's program of converting primary feeders outside the city from 4 to 13 kv. Design criteria limited the steady-state voltage drop from the transformer secondary terminals to the meter to 4%. Maximum permitted voltage dip was set at 4% also, this applying to the worst case of a customer's self-caused flicker. Simplicity was stressed in the design of the underground system. The utility's and other companies' experience with buried cable systems indicated that cable failures are infrequent. On this premise, a radial system was selected. Primary and secondary cables will be buried directly in the earth without such mechanical protection as concrete, or creosoted planks. The pad-mounted distribution transformers will be set on concrete mats.

On the basis of the foregoing, overhead 120/240-v and underground 240/480-v systems were designed and field layouts were prepared. Terrain, trees, and lot layout required rather extensive overhead construction and a large number of various-size poles.

Estimates for supplying 72 houses indicate that the utility investment for 240/480-v underground is comparable to that for a 120/240-v overhead system. Included are 13-kv primary, transformers, secondary, services, metering, and dry-type 240/120-v autotransformers. The

Table I—Connected Load and Maximum 30-Min Demand of One Total-Electric Home

	Type of Load	Connected Load	Max.	7:00 AM	6:00 PM
I.	Autotransformer Load				
	Refrigerator	0.184 Kw	0.171	0.135	0.162
	Food Waste Disposer	0.345 Kw	nil		
	Laundromat	0.300 Kw	0.240	0.110	0.180
	Lighting & Misc.	5.871 Kw	1.08	0.443	0.993
	Coincident	6,700 Kw		0.688	1.335
II. a.	Oven (Broiler = 3800 w)	6.800 Kw	2.23	0.669	2.23
b.	Platform	6.700 Kw			
III.	Quick Recovery Water Heater Upper 4500 w Lower 4500 w	4.5	4.43	3.38	2.88
IV.	Dryer (1/6 hp motor) 25-"Built-in" 4.6 Kw heater plus 200 w motor	5.0 Kw	4.20	.....	0.924
V.	Dishwasher	1.920	0.667	0.033	0.534
VI.	Heat Pump		23.5	23.5	17.55

	Per Motor			
	Locked Rotor		Running	
	Amps	Pf	Amps	Pf
2—2½ hp Compressors	74	0.89	19.8	0.89
2½ hp Condenser Fan	9.0	0.805	3.1	0.72
1¾ hp Evaporation Fan	12.5	0.81	3.9	0.68

Serves New Home Area Economically

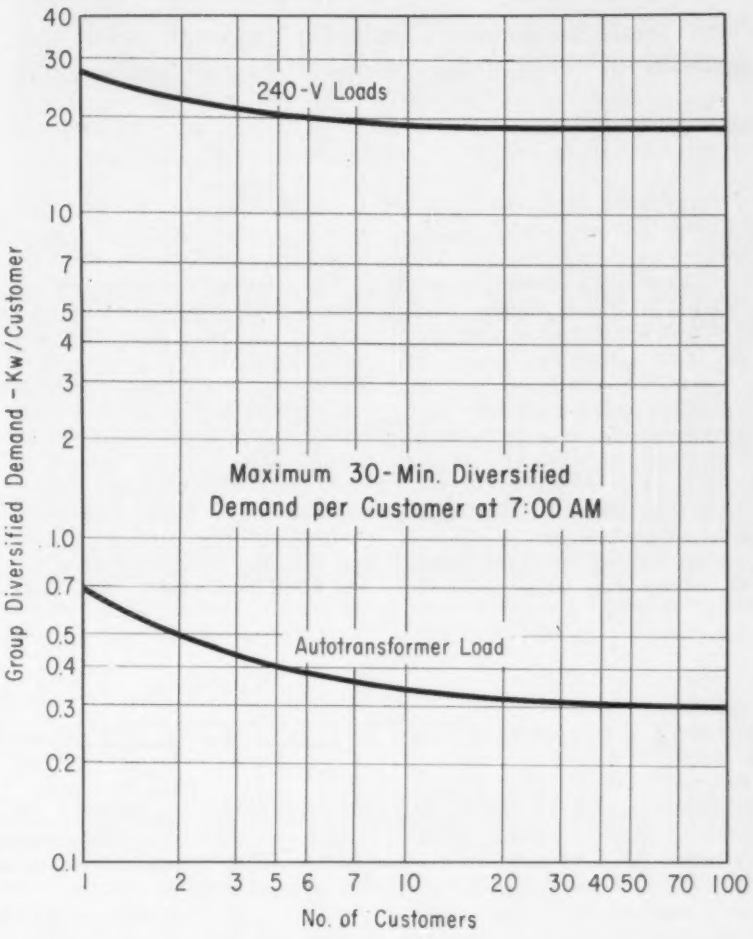
autotransformers for the trial installation will be purchased by the utility and given to the developer who will install them on the load side of the meter. The developer will excavate and backfill the trenches, install conduit under paved areas, and set transformer pads at his own expense. Consultations continue on whether telephone lines will share trenches with the electric cable.

Three-wire, 240/480-v distribution will serve each house. The autotransformer on the load side of the 480-v, 3-wire meter will supply 120-v service. Demands indicate it could be 3 kva, but the local inspection authorities, because of the lack of documentary load data, require that it be sized in accordance with the National Electrical Code, calling for a 7.5-kva rating for the first homes. Instrumentation, when installed, will provide load data expected to justify a smaller rating.

Grounding Assures Safety

All major energy-consuming and fixed-type appliances will be designed for 240-v-to-ground usage. They will include heat pumps, oven and cooking platforms, dryers, water heaters, and dishwashers. General changes necessary in these appliances for higher-voltage-to-ground use involve component spacing and some redesigned components. Safe operation will be assured by secure grounding of each device's metal frame to a separate non-current-carrying ground wire independent of the electrical system. All appliances will meet standards and specifications for present practice. Inspection authorities approved the installation.

General studies of residential distribution systems showed for years that considerable savings are realizable through a higher secondary voltage. This installation is expected to demonstrate the real worth of higher secondary voltages for residential service. Kingswood was only possible through the cooperation of the utility, manufacturer, developer, and inspection authorities. J. W. McCrocklin is developing the plan with designs by D. J. Olivola, architect.



CURVE shows the group diversified demand for various numbers of customers at 7 am. Greatest half-hour demand is explained in connected load in the text

Table II–Details of Alternate Systems Compared

	Underground 240/480 Volts	Overhead 120/240 Volts
Primary	No. 4, 1/C, 15 kv, PILC Neoprene jacketed cable	No. 2 aluminum, spacer-type cable with ⅜ in. copper-weld messenger, inverted-wye configuration
Secondary	250 and 500 MCM, 1/C, copper, 600-v rubber-insulated, Neoprene-jacketed for direct burial	No. 3/0 aluminum triplex
Services	No. 4 copper, 1/C, 600-v, rubber-insulated, Neoprene-jacketed for direct burial	No. 2 aluminum triplex and No. 3/0, aluminum triplex
Transformers	167 to 250 kva, Single-phase (permissible loadings: Winter—160%, Summer—120%)	25 to 75 kva, Single-phase (permissible loadings: Winter—160%, Summer—120%)

11-Kv Underground Feeds Shopping

Three single-conductor cables bring power to seven spot networks at Lloyd Center, largest US shopping complex

GEORGE DREWETT, Pacific Power & Light Co, Portland, Ore.

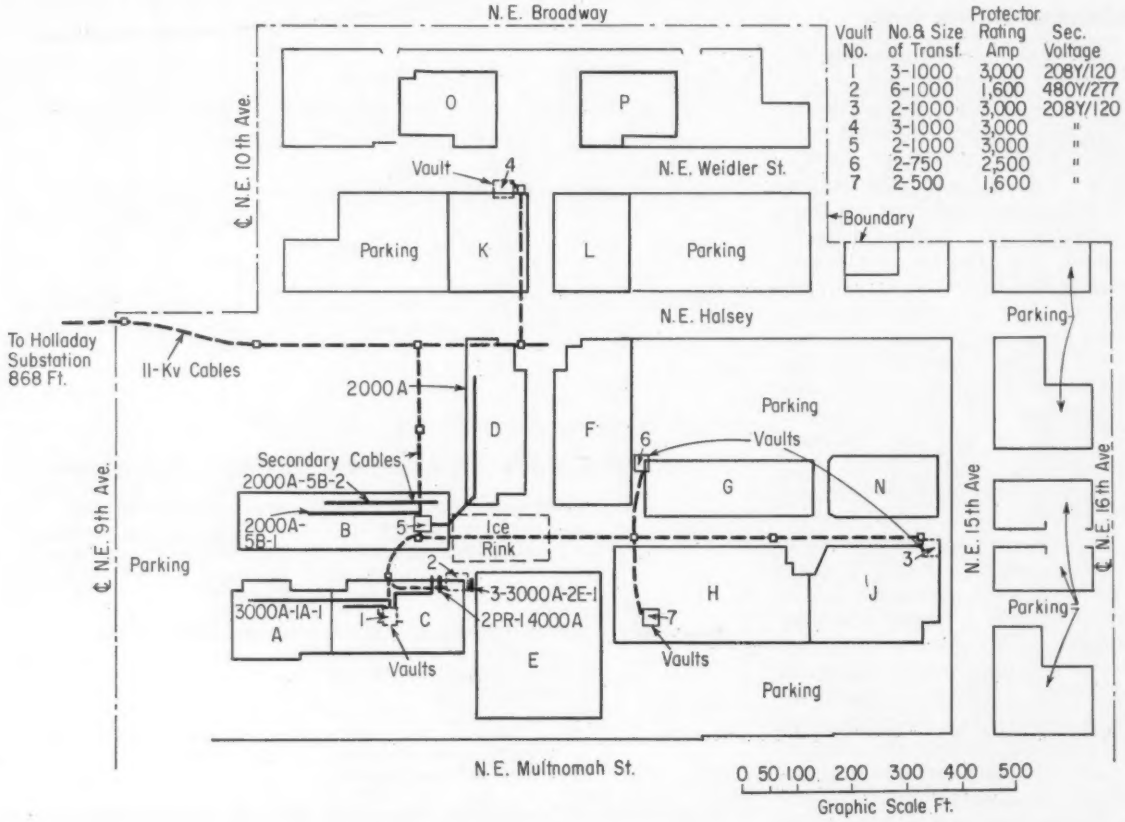
Three 11-kv underground feeders to seven spot network vaults were installed by Pacific Power & Light Co to serve Lloyd Center, scheduled to open in July in Portland, Ore. Overhead distribution was not practicable for so large an area and such a high load concentration.

Pacific Power will own and maintain most of the secondary distribution system up to the metering. It will be mostly low-impedance, ventilated bus duct with plug-in and bolt-on tap-off devices.

Lloyd Center, reportedly the largest metropolitan business-shopping development in the US, is in one of the most prosperous and fastest growing regions. Some 600,000 people live within a 20-min. drive. It is across the Willamette River from Portland's downtown district.

The building T-arrangement extends 1,160 ft north and south and 1,250 ft east and west. There will be 1,200,000 sq ft of rentable floor space in air-conditioned buildings, with provision for an additional 160,000 sq ft. One feature will be an ice-skating rink 50% larger than Rockefeller Center's with accommodations for 2,200 spectators. About 6,500 cars can be parked on the site, nearly half under cover, and 1,500 more nearby. Two east-to-west streets traverse the area.

All loads will be served at 120/208 v, 4-wire wye, except the Meier & Frank Co and project services. These will be served at 277/480 v, 4-wire. Project services include the ice-rink compressor driven by a 100-hp motor using a reduced-voltage starter; the five-boiler, oil-fired heating plant; several escalators; truck turn-table motors; parking area lighting; and, all tenants furnished electricity in accordance with their rental contracts. The project load was calculated at 13 w per sq ft. This load includes lighting and air-conditioning as stipulated by the Portland Electrical Code, plus 20%. The air-conditioning load is supplied by six centrifugal compressors driven by motors 170 to 425 hp, totaling 1,765 hp.



Vault No.	No. & Size of Transf.	Protector Rating Amp	Sec. Voltage
1	3-1000	3,000	208Y/120
2	6-1000	1,600	480Y/277
3	2-1000	3,000	208Y/120
4	3-1000	3,000	"
5	2-1000	3,000	"
6	2-750	2,500	"
7	2-500	1,600	"

LAYOUT shows primary system coming from left to seven spot network vaults and gives the route and general location of the manhole and duct system. Secondary runs to metering points are shown from each vault

Center

Transformer capacity totaling 18,500 kva will meet a demand of 12 to 14 Mw. Transformers are the dry type (80C rise), 5% impedance, rated 12 kv to 216Y/125 v or 480Y/277 v, with four 2½% taps below 12 kv. Each of the seven vaults constitutes a spot network with no secondary tie among them.

Continuity Assured

Service continuity from Holladay Substation, three blocks west, will be excellent. The substation is fed from two 69-kv lines originating at a large-capacity substation fed from several sources. The 69-kv OCB's for automatic sectionalizing are wye connected assuring power except in a system blackout. The two 10,000/12,500-kva, 69-12-kv transformers in the substation are wye connected on the low side to provide a ground for relaying on the project feeders. The lead sheaths of the feeder cables have enough capacity for the relay ground-return circuit.

Each of three feeders to the project has three single-conductor, 500-MCM, 15-kv, PILC cables formed at the factory into a triplex cable. Provision has been made for a fourth position, and yard space is available for two more.

Splicing Simpler

Tests by manufacturers proved that incremental movements along the cable due to load cycling will be nullified by the slight flexibility of single-conductor cables in a spiral assembly. In a straight and rigid three-conductor cable the entire movement would be transmitted longitudinally to the duct ends. Current-carrying capacity is greater for the same conductor size and voltage rating than that of three-conductor cable.

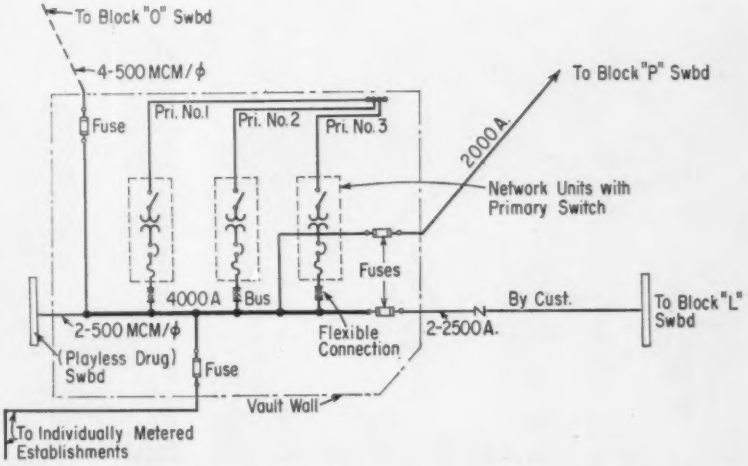
Splicing of conductors in manholes is simpler and less expensive than on three-conductor cables. Splices on the latter would be impracticable where there are three or four-way splice points tapping off to transformer vaults. With three feeders passing through most manholes, the use of three-conductor cables and the necessary single-conductor buses would create congestion.

LLOYD CENTER, outlined by white dotted line, and Holladay Substation, circled in white, are tied together by three sets of single-conductor 11-kv cables

Single-conductor 4/0, 15-kv PILC cable was used at tap-off points between manholes and the various transformer vaults. All cables exposed in the manholes and vaults were fireproofed.

The main duct line runs consist of 4½-in. fiber ducts in a concrete envelope. The six-duct bank is arranged in a single bank two wide and three high. All cable ducts up building columns to vaults, or where there are bends or offsets, consist of 4-in. rigid steel conduit.

Transformers and primary feeders are large enough to carry extra



ONE-LINE SCHEMATIC shows transformer vault No. 4, which contains three 1,000-kva transformers, each 12,000-216Y/125 v. Largest vault has six

load for as long as it takes to make repairs when a feeder or transformer fails. All transformers have dial-type thermometers with circuit-closing contacts and maximum-reading indicators. It is planned to install a two-conductor No. 14 metallic circuit from each vault to the supply substation for indication of abnormally high temperature and open position of a network switch. This will only indicate the vault where trouble has developed. Customers provided the transformer vaults, each equipped with thermostatically controlled, forced-ventilation units. Cooling air is drawn from and exhausted into areas connected directly to the outside air.

Secondaries Bused

Transformer secondaries in each vault are bused together through the network protectors by means of low-impedance, ventilated bus duct. An enclosed bus extends from the top of each network switch upward and across to the main bus, making a completely metal-clad installation. To prevent transfer of vibration from the transformer to the riser bus, a soft rubber ring was inserted between the top of the network switch and the lower end of the bus riser, eliminating metal-to-metal contact. Flexible copper ribbon connections between the network switch terminals and the lower end of the bus bars prevent transfer of vibration to the lateral bus runs.

Pacific Power will extend the secondary bus to serve a large customer switchboard not more than 10 ft beyond a vault wall when vault and switchboard are in the same block or building. When a switchboard is in an adjacent block, the utility will extend the bus 10 ft inside the block. Where several small stores are supplied from a standard distribution panel, the utility will own all facilities, regardless of the bus length, up to the meter base, or metering CT's.

Bus on Premises

The bus installation, except that inside the vaults, is on customer premises and must conform with the Portland Electrical Code. A bus run from which small store taps are taken is classed as a feeder and must be fused in the vault near the tap-off point at the main bus. Buses feeding single, large switchboards do not require fusing unless the bus exceeds 40 ft. Were the bus size in any bus run reduced to less than a third of its original capacity, fuses would be required at the point of reduction. Fuses in all cases are current limiting to give adequate bus fault as well as overload protection.

Switchsticks Usable

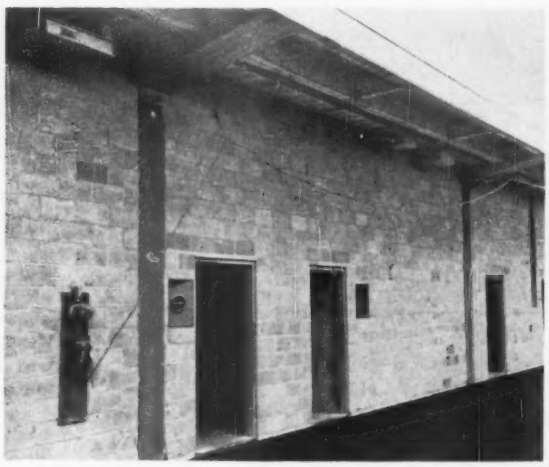
With one exception, the fuses are in hinged-cover enclosures near the vault ceiling. Fuse holders are mounted on ebony asbestos bases, and the terminal on one end of the fuse is extended to allow switchstick operation. The fuse holder jaws are clamped by tightening nuts over Belville washers.

Each large store and a few smaller ones will have their own distribution center switchboard where the customer's master meter will be installed. About 90 tenants throughout the center will be individually metered. About 30 or more office tenants will be furnished electric energy as part of their rental cost.

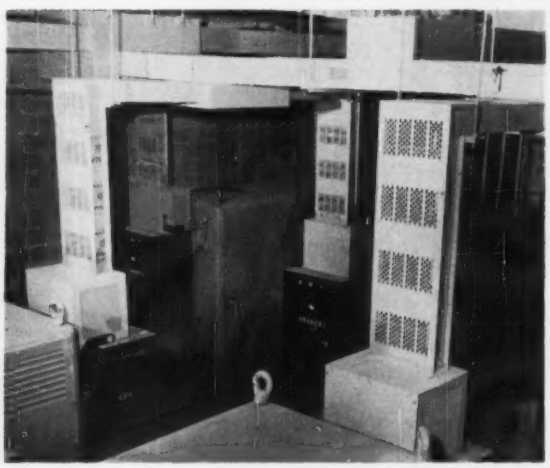
Meters serving most smaller stores are along the sides of the truck concourses on the second-floor level. The remaining few meters are along a passageway at the mall level and the basement truck concourse. Loads, having an estimated demand in excess of 10 kw, require watthour meters with demand attachments. All services sized for more than 200-amp capacity must have current transformers.

Meter Boxes Adaptable

Meter boxes are adaptable to either the 200-amp self-contained meter using a seven-terminal base, or a 2½ or 5-amp meter using a 13-terminal base. The metal is 15 by 20 by 16 in., mounted with the front edge flush with the outer wall but having sufficient depth to prevent projection of the meter beyond the outer wall surface. A metal plate 5 in. from the back of the box, through which the face of the meter base projects slightly, provides the lip for the meter clamping ring.



BUS RUN has tap-off boxes under projecting roof. Note recessed meter receptacle on wall near door



BOX atop protector houses flexible shunts isolating transformer vibration from overhead, enclosed bus

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General Electric's complete line of oil-filled **55°65°** distribution transformers provides 12 percent more kva capacity—at no price increase or loss in normal operating life. This added capacity is made possible by using Permalex* insulation—a major innovation in transformer insulation systems which was developed by General Electric and is used in oil-filled distribution transformers.

The use of superior Permalex insulation permits transformer operation at higher average winding rise (65 C) without loss of normal operating life. This means you can carry 12 percent more kva with General Electric Permalex insulated transformers.

Every General Electric **55°65°** transformer has a second nameplate kva rating. The new, higher rating reflects the 12 percent kva increase—allowing you to utilize the added capacity within your established loading practices. *And the new rating retains the same design margin between stated temperature rise and actual rise—consistent with traditional General Electric distribution-transformer design practices.*

General Electric's new approach to greater kva capacity is accomplished through advanced interior transformer design. Permalex transformers retain the same small size and light weight—but with substantially increased kva capacity.

Before you buy another transformer, ask your G-E Sales Engineer to show you the story of the **55°65°** transformer. It takes just a few minutes and can save you many dollars in transformer investment and operation. Or, write for more information to Section 482-08, General Electric Co., Schenectady, N. Y.

*Trademark of General Electric Co.

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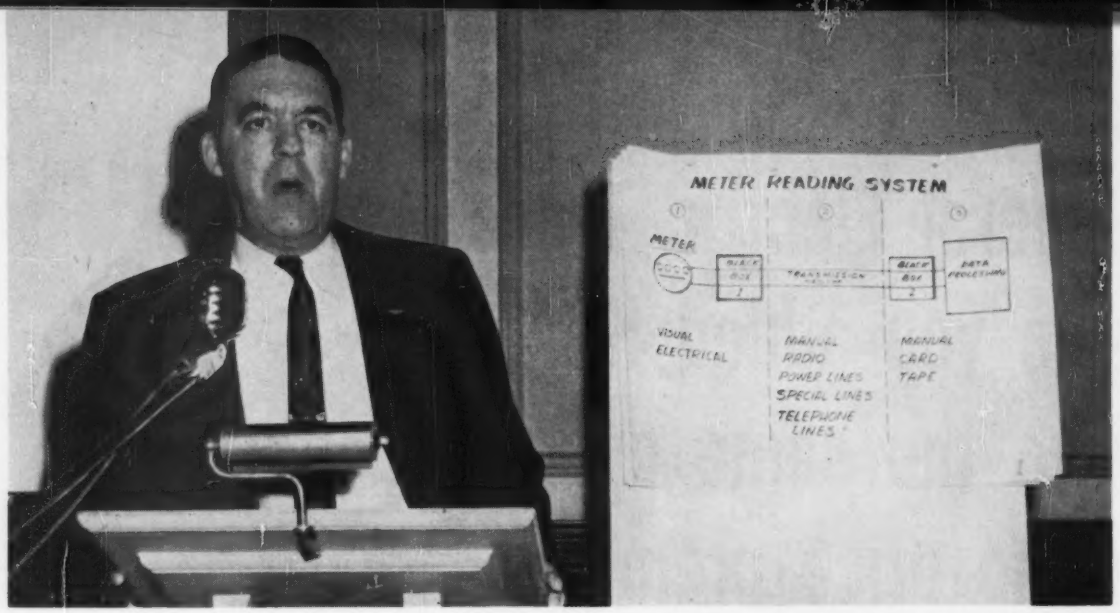
GENERAL ELECTRIC

COMPLETE LINE OF 55°65° POLE-TYPE TRANSFORMERS now available from G-E warehouses across the country. Instrumental in the development of this new transformer design were Dr. R. Flowers, insulation laboratory chemist and co-inventor of patented cyanoethylated kraft; J. Silverstein (front), Product Planning Specialist; and J. Leslie, insulation laboratory chemist.



L. W. GARRAND, Fairchild Engine Corp, tells EEI-AEIC Meter & Service Group that remote metering requires equipment for that purpose, combined with transmission and data processing equipment at central headquarters

Remote Meter Reading Urged

Held now technically and becoming economically feasible by L. W. Garrand, addressing EEI-AEIC at Madison

Remote meter reading is technically and may become economically feasible, the Edison Electric Institute-Association of Edison Illuminating Cos' Meter & Service Committee was told recently at Madison, Wis. Exhaustive analysis of the economics of each feasible solution was urged by L. W. Garrand, Fairchild Engine Corp.

Remote reading will require equipment for that purpose and for transmitting the readings to a central headquarters where the data can be processed, he said. The fact that there are millions of meters—electric, gas, and water—means that repetitive production techniques can be used to cut the cost per installation to $5 or less, Garrand said.

Phone Link Less Costly

Analyzing several methods of transmitting data, Garrand asserted that radio would be too costly and power-line carrier not entirely satisfactory, but telephone connections would be both practicable and economical. Telephone transmission frequency, he said, could be below that used for normal voice.

More expensive equipment would be needed at the headquarters for processing data, Garrand said, noting that, on the other hand, a single installation could handle a large number of meters at a very low cost per meter.

All meter manufacturers have entered the field since Duncan Electric Co announced plans to incorporate magnetic bearings in single-phase watthour meters. Sangamo Electric Co and Westinghouse Electric Corp announced similar plans at the meeting, and General Electric Co has used magnetic suspensions for some years.

Random Sampling Gains

The meeting heard that random-sample or selective meter testing appeared to be gaining, and the latter term was deemed better as a description of the practice. A survey indicated that six more of the 50 companies represented were awaiting commission approval on test plans and that eight had prepared plans yet to be submitted.

A plan submitted by Public Service of New Hampshire, providing penalties and rewards for accuracy, was described by G. F. Austin. Its minimum sample is 1%, but the actual number of meters to be tested each year would be determined by a curve of the results of tests over the past five years.

To Outline Program

The meeting appointed a subcommittee to outline a program for selective testing.

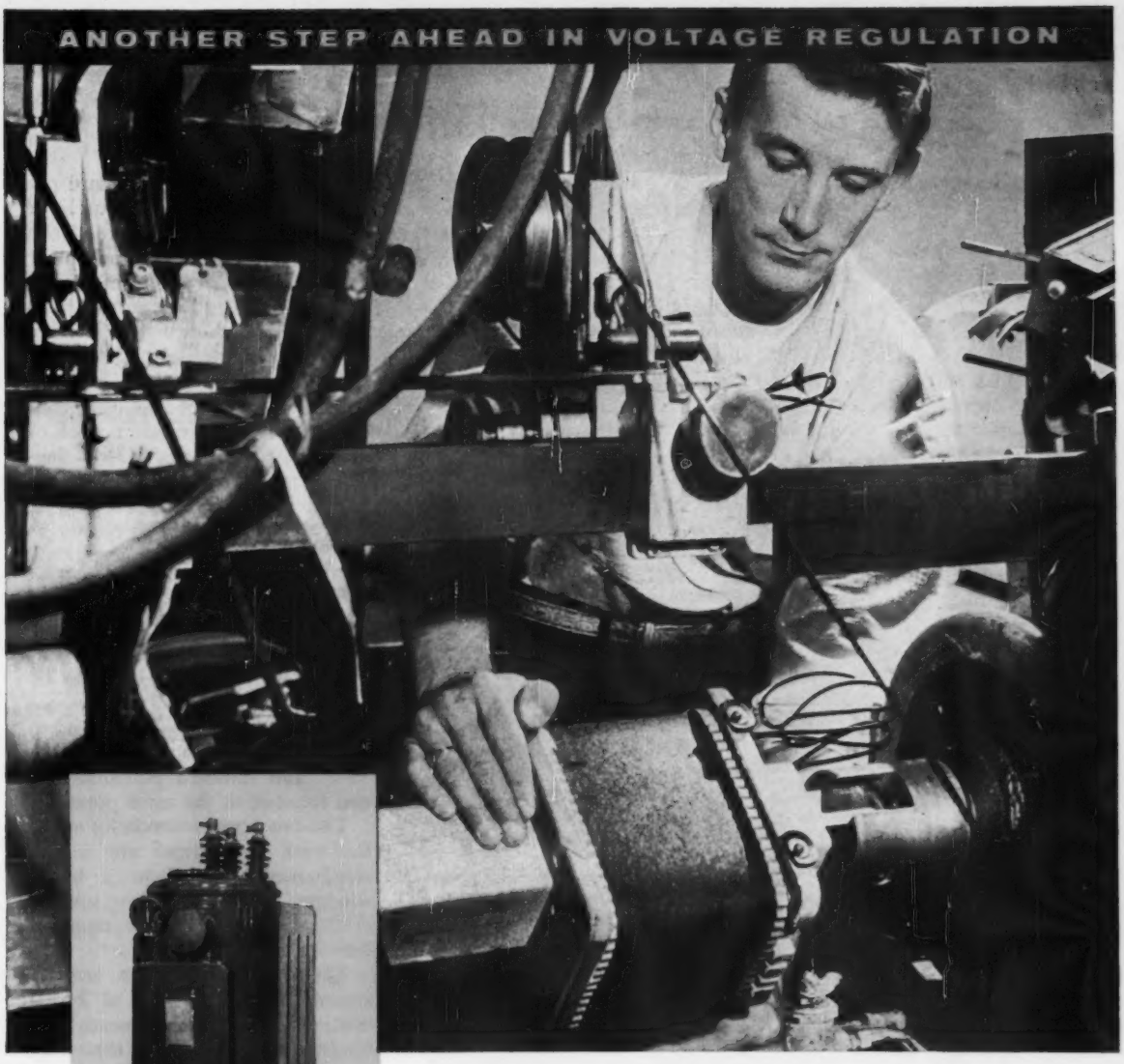
Harold Farrington, Texas Electric Service Co, urged development of a hermetically sealed meter and noted that 96% of meter troubles on his company's system would have been avoided were the meters sealed. He was supported by Floyd Salmon, Central Power & Light Co.

'Demand' Debated

The committee debated deleting the word "demand" from the face of meter registers and name plates, but the vote opposed such action. The public relations responsibilities of meter men were stressed by Carl J. Forsberg, Wisconsin Power & Light Co, who noted that meter men met the public more often than other company representatives.

The meeting was informed that 17 state commissions are now making rules changes.

ANOTHER STEP AHEAD IN VOLTAGE REGULATION



NEW Permalex Insulation

Permalex* coil insulation in General Electric voltage regulators boosts reliability—lengthens regulator life

New Permalex insulation—another regulator first from General Electric—is now standard on all G-E ML-32 single-phase, step voltage regulators. Permalex makes possible added regulator economies through longer core and coil life and greater reliability—at no price premium.

Permalex insulation preserves high dielectric strength because of the special cyanoethylation of its kraft insulation paper. This process, exclusive with General Electric, retards formation of moisture released by cellulose materials under load—slows aging process of insulation to give you longer regulator life. Permalex insulation is fully compatible with other regulator components and provides a true *system* approach to regulator design.

Another outstanding G-E regulator feature which increases quality, Permalex insulation gives you more regulator for your money. It is, in fact, another reason why *G-E regulators cost less on the line.*

Ask your General Electric regulator representative for more information about Permalex-insulated ML-32 regulators—as well as the entire line of G-E voltage regulators. Or, write to Section 456-03, General Electric Company, Schenectady 5, N. Y.

*Trade-mark of General Electric Company

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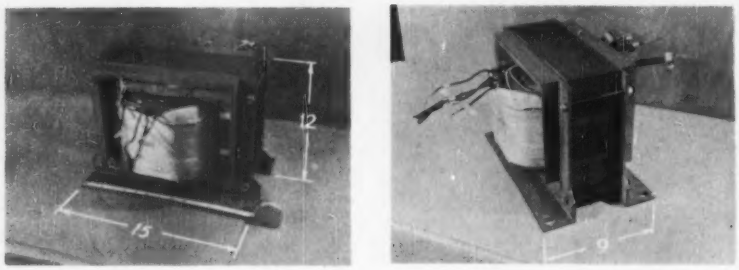
Test 3-Wire Meters With Link Closed

R. A. K. FLEISCHMANN, Chief Engineer, Eastern Specialty Co, Philadelphia, Pa.,
F. E. DAVIS, President,
D. F. CARLISLE, Chief Engineer, Anchor Mfg Co, Manchester, N. H.

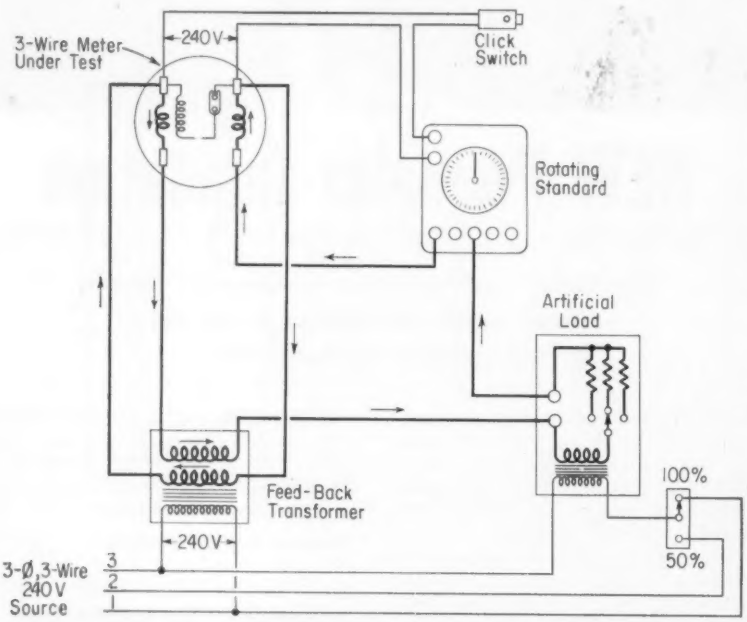
Testing 3-wire, 240-v single-phase watthour meters with the test link closed applies full line potential between the current coils, simulating service conditions. A new method for testing with the link closed insures that both current coils carry the same current.

A feed-back transformer introduces a counter emf into the load side of the current coils which is equal and opposite to the potential applied to the line side of the two coils. Therefore, no current can flow in the circuit except that due to the secondary voltage of the artificial load, which is inserted into one of the legs of the series circuit. The heat is dissipated only in the resistors of the low-voltage artificial load.

The primary of the feed-back transformer carries only its own exciting current plus the exciting current of the meter and standard potential coils. The ampere-turns of the two heavy-current secondaries balance out and cancel each other at all values of load current.



FEED-BACK TRANSFORMER has a rating of 12 kw, as secondaries are designed to carry 50 amp at 240 v continuous. Dimensions of the transformer are in inches



SCHEMATIC DIAGRAM shows one of many possible circuit modifications. The method is equally applicable to this simple circuit or more complicated ones

The circulating load current need not be in phase with the primary voltage as shown in the diagram. A switch in the primary of the artificial load can shift the voltage of the latter over to another phase of the polyphase source, thereby lagging the circulating current 60 deg behind the meter current voltage. A 50% power factor test can therefore be made in the conventional manner, except that the effect is to lag the current rather than lead the voltage.

If the interconnections are of sufficiently heavy copper, then the IR drop of the loading current will not conflict with the potential applied to the meter. In any case, both the meter and standard potentials are tied together at the same point.

The two heavy secondaries of the feed-back transformer are wound simultaneously to form a bifilar winding. This insures low leakage reactance and good wave shape of the current.

The heavy secondaries are designed to carry 50 amp at 240 v continuous duty. This means that the feed-back transformer must have a rating of 12 kw. Even with this rating, the dimensions are not excessive, as may be seen in the photographs.

The schematic diagram shows only one of the numerous possible circuit modifications, all based on the same principle. Because it concerns only the means whereby current and potential are applied to the meter and standard, the method is equally applicable to the simple circuit shown or to the more complex testing facilities which have come into use in recent years, such as automatic sequence electronic readout test boards.

Although other methods are available for testing meters with the test link closed, they require dual loading circuits or are difficult to ventilate.

Control boards at the Gulf States Utilities Company's Roy S. Nelson Station, near Lake Charles, Louisana.

Using compact General Electric SBM Switches, Stone & Webster Engineering Corp. installs . . .

3 control boards in the space of 2

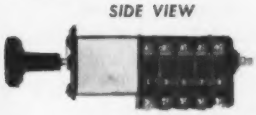
. . . for Gulf States Utilities Company

Control board space requirements reduced one third—that's what Gulf States Utilities Company achieved at its Willow Glen and Roy S. Nelson Stations using compact General Electric SBM transfer and control switches.

The Stone & Webster Engineering Corporation designed and built the stations for Gulf States, and recommended G-E SBM switches because of their small panel mounting dimensions (2½ inches high by 2⅝ inches wide), and wide versatility of contact arrangements.

FRONT VIEW

SIDE VIEW



The SBM switch has one to 10 stages, with two electrically separate and mechanically independent contacts per stage. For field modifications, an "add-a-stage" feature permits two additional stages to be coupled to the rear of existing switches with one to eight stages.

Electrical rating of the SBM switch is 300 volts a-c or d-c, 20 amps continuous. Increased interrupting rating permits a wide range of applications.

Ask your G-E Sales Engineer how *you* can save valuable control room space using this compact, versatile switch. Or write to Section 534-02, General Electric Company, Schenectady 5, N. Y., for Bulletin GEA-4746D.

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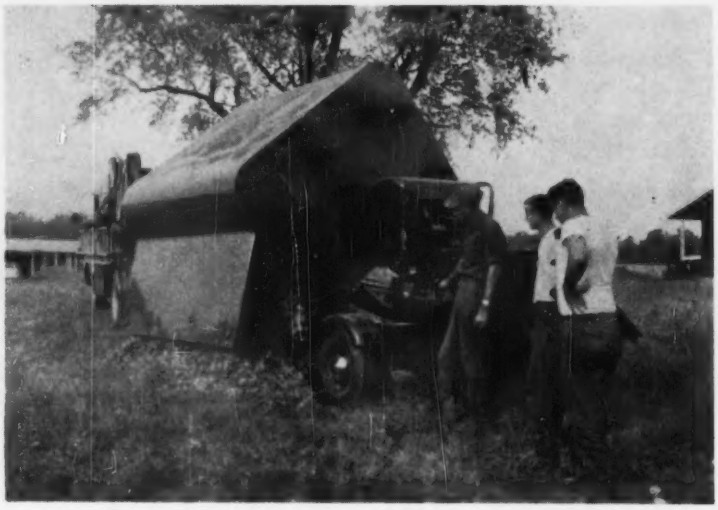
Hydraulic Dumper Speeds Chip Disposal



W. S. BRENNEMAN, Forestry Representative, Illinois Power Co, Decatur, Illinois

Hydraulic dumping has facilitated the disposal of chips for Illinois Power Co's tree trimming crews. A 12-in. chipping unit and box for chip storage are mounted on a tandem-wheeled trailer. The box holds 300 cu ft of chips. Normally a crew doing operational trimming will fill the box not more than twice in one work day. The unit was developed by R. S. Ewers, chief transmission and distribution supervisor, and Henry M. Huffman, automotive supervisor of Illinois Power.

The box tips to the left side hydraulically to eject chips. A door, hinged at the top, extends across the lower left side of the box. This door is unlatched before the box is raised and the chips slide out. When it is not necessary to haul chips from the job site, a door is positioned to blow the chips to the side.

The unit has these advantages:
1. Conventional line clearing trucks need not be modified for hauling chips. Flexibility is achieved in that any of the company's line clearing trucks can pull the chipper.
2. The truck bed can be used for hauling logs and large pieces.
3. The truck and its winch may be used at another location while the chipper handles brush.
4. Only one truck-driver-groundman is required for each crew.
5. Chips are dumped quickly and easily.
6. Placing the chipping unit at the rear allows the operator to feed the brush into the unit without the ends projecting into the street or onto the sidewalk. Unloading from the side facilitates unloading at the dump; the trailer doesn't have to be backed to the edge of the dump.

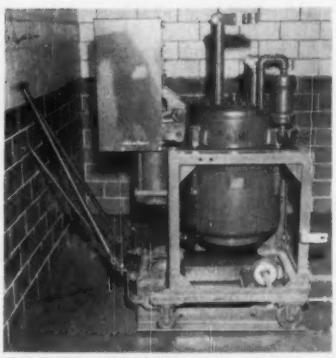
Dolly Moves Breaker Over Painted Floor

V. L. THACKER, Station Foreman, Appalachian Power Co, Huntington, W. Va.

Moving of 4-kv oil circuit breakers with cast-iron wheels is easier, and damage to painted floors is eliminated with a rubber-tired dolly built for maintenance crews of Appalachian Power Co's Huntington District. The dolly also has solved the problem of handling the breaker in the narrow aisle between the cubicle and the walls.

The dolly is built of an angle-iron and channel-iron frame mounted on two fixed-axle wheels and two 6-in. diameter swivel wheels. The breaker is locked to the dolly at the front end with a ½-in. eyebolt and nut. Two men can load the breaker on the dolly and one man can pull it to the inspection area.

At this area a 4 x 8-ft sheet of ½-in. plywood, painted with two coats of varnish, is laid on the painted floor to protect it. After the breaker is pushed off the dolly, the tank is lowered and the breaker moved to the other end of the plywood sheet.



CIRCUIT BREAKER is moved and handled easily on rubber-tired dolly

FOR PIPELINE, PETROLEUM INDUSTRIES

FOR INDUSTRIAL POWER DISTRIBUTION

FOR ELECTRIC UTILITIES

FOR COMMERCIAL BUILDINGS

NEW GENERAL ELECTRIC **SOLID-STATE** SUPERVISORY OFFERS...

Versatile, Economical Remote Control for a Variety of Applications

New General Electric solid-state supervisory equipment, with pre-tested transistorized logic elements, is now available to control and supervise any piece of electrical apparatus having provision for local control. No matter what the application—in pipeline and petroleum industries, electric utilities, industrial power distribution applications, or in commercial building and municipal projects—this equipment now provides better operational programming and improved utilization of equipment and personnel.

You also get top economy. In addition to impressive application versatility, G-E solid-state supervisory offers important money-saving features. You save up to 50 percent on costly space. Time-saving ease of installation is afforded by 25 percent reduction in equipment weight.

Once installed, maintenance is cut drastically because the new logic elements have no moving parts, require no adjustments. Solid-state logic elements on plug-in cards are available for off-the-shelf delivery.

If you need versatile remote control for your equipment, it will pay you to get all the facts on solid-state supervisory control by General Electric. Contact your nearest Apparatus Sales Office today, or write for publication GEA-7043, General Electric Co., Schenectady 5, New York.

513-12

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Procurement & Products

COMPETITION ▶ **In a decision that could eventually affect utility purchasing,** the US Supreme Court has ruled that Federal Trade Commission has the right to prohibit regional price-cutting if it restricts competition. While not raising "the spector of a flat prohibition of price differentials," the court decision illustrates a theory of the Robinson-Patman Act that price cutting by a big supplier may tend to drive smaller suppliers out of business, thus tending to give the big supplier a monopoly position in a given market. And any price situation that "tends to create a monopoly" is illegal. Normally, the Robinson-Patman Act is thought of in terms of protecting smaller retailers from being injured by price-cutting deals between big manufacturers and big retail customers.

The ruling, which upset a lower court decision that had cleared a brewer of FTC charges that the brewer had violated antitrust laws by cutting beer prices in the St. Louis area alone, did not say that a company could not defend itself against price discrimination charges. This can be done if the company proves competition was not sufficiently injured, or if it can show the price cuts were designed either to meet competition, or to account for differences in costs, or to keep up with changing market conditions.

FLEETS ▶ **Look for the appearance later this year** of smaller American-made trucks by at least two of the big manufacturers. These entries are being made because of the significant inroads being made into the domestic market by foreign makes.

PRODUCTS ▶ **Wagner Electric Corp has raised by 12% the ratings** on its entire line of pole-type distribution transformers in ratings of 5 through 167 kva, 18 kv insulation class and below. These ratings feature new coil designs with lower impedances and higher short circuit strength; advantages achieved by employing an improved insulation system design to provide greater overload capability without increasing hot spot temperature rise beyond the present ASA Standard limit of 65C.

MANUFACTURERS ▶ **Electrical manufacturers' profits in the first quarter** were well below the average of all manufacturers on the basis of profits per dollar of sales. Electrical manufacturers averaged after taxes only 4% on sales revenues while other manufacturers averaged 4.7%. The same was true all of last year except for the fourth quarter when electrical manufacturers averaged 4.9% compared with the all-manufacturing average of 4.5%. These figures are from the Quarterly Financial Report put out by the Federal Trade Commission and the Securities and Exchange Commission.

News of Manufacturers.....page 58
New Equipment.....page 64
Readers Service.....page 66

NEW 333-KVA FEATHERWEIGHT POLE STAR® TRANSFORMER SUITABLE FOR MOUNTING ON CLASS 3 OR CLASS 4 POLES

Pennsylvania triples power per pole in just seven years!

Development of the 333-kva Featherweight Pole Star means that the practical limit for single-transformer power per pole has been more than *tripled* in just seven years. Pennsylvania first broke the "100-kva barrier" on pole-mounting by introducing the 167-kva Featherweight in 1953.

Total weight of the 333-kva Featherweight Pole Star — available through 15 kv — is approximately 2200 pounds. Thus, on the basis of National Electric Safety Code requirements, the 333-kva Featherweight is suitable for mounting on either a 45-foot Class 3 or 35-foot Class 4 southern pine or douglas fir pole.

It is of more than historical interest that the new Featherweight weighs only half as much as the 333-kva, 15-kv Pole Star of just four years ago. Besides permitting more power per pole, this remarkable weight reduction means easier handling, easier installation on pad or platform and less costly supporting structures.

Lower Impedance, Improved Regulation

In addition, the new 333-kva Featherweight Pole Star provides improved regulation—with average impedances of 2.5 to 3%, compared to an average of 4 to 5% for the station-type unit it replaces. Other operating characteristics are equal to or better than those of station-type transformers.

The family of Featherweight Pole Stars now includes 167, 250 and 333-kva units, 15 kv and below—especially suitable for new shopping centers, for established neighborhoods with fast-growing load requirements, and for other applications requiring the maximum in pole power. Contact Distribution Sales, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON

PENNSYLVANIA DISTRIBUTION TRANSFORMERS

I-T-E Develops New 4,160-Kv Switchgear

ARC CHUTES of specially-developed ceramic material can be removed quickly without tools and carried by one man —one feature of I-T-E's newly-designed switchgear

A new design of 4,160-v circuit breakers and switchgear combining stored-energy closing and ironless blowout has been announced by the Switchgear Div, I-T-E Circuit Breaker Co. The breakers afford fast fault interruptions and closing of contacts and feature a smaller size than previous units.

The equipment has been developed for commercial and industrial use as well as by utilities.

Extremely fast contact closing, provided by the stored-energy closing principle, has been incorporated to improve contact life and afford greater safety for personnel and equipment.

A high-power spring, with a wide safety margin, stores energy supplied to it by a high-torque motor charging through a simple ratchet and pawl system. The spring holds energy until it is called for by an operator or automatic control system. Closing power is stored in the spring and one closing operation is automatically available even after control voltage is lost.

The excess energy not used in a closing operation is stored in the spring as a partial re-charge for its next operation. Control voltage can be supplied from any normal lighting circuit—such as 115 or 230 v ac—or from a 48 to 250-v dc supply.

Face-wound blowout coils produce a high-flux-density, uniformly distributed, in-phase field which pulls the arc up into the chutes faster to cut interruption time, increase contact life and reduce erosion of chutes.

The breakers fully extinguish arcs within five cycles. Arcs are forced up into extinguisher plates of specially-constructed ceramic material. Arc chutes tilt back by hand for inspection.

A-C Buys Into Custom-Engineered Electronic Control Firm

Through a joint agreement with Bell & Howell, Allis-Chalmers acquires 50% of the common stock of Consolidated Systems Corp, Monrovia, Calif, manufacturer of custom-engineered electronic control systems. Bell & Howell, whose Consolidated Electro-dynamics Corp has operated the firm as a wholly-owned subsidiary, retains the other 50%.

Reason for the move was spelled out by A-C's President R. S. Stevenson, "In recent years application of electronic instrumentation to industrial processes, including power generating, has increased tremendously. Many of our customers are now looking for us to provide them not only with industrial equipment, but also the systems control necessary to automate their processes."

B&H's President Charles H. Percy said a major objective of Consolidated Electro-dynamics "is to increase its share of the industrial control instrument market . . . CEC has been an important factor in the design and manufacture of analytical and control, data-processing, dynamic-measuring and recording, and high-vacuum equipment."

With a direct pipeline available to technical guidance on custom-engineered electronic control systems, another A-C spokesman said, A-C salesmen will be able to market complete equipment. They will no longer have to rely on subcontractors or suppliers to meet a production schedule for control systems to be obtained through them.

Kenneth W. Patrick, previously group vice president of Consolidated Electro-dynamics, becomes Consolidated Systems' president. CSC's Harry E. Burke continues as vice president and general manager; Jack J. MacDonald as vice president. Patrick comments "The joint ownership does insure more rapid growth for CSC in the highly desirable industrial instrumentation and automation markets."

CSC has designed and built custom-engineered systems for six years. One-third of its 525 employees are technical personnel. Directors are from B&H, A-C, CEC, and CSC. Chairman is William E. Roberts, B&H executive vice president.

(*More News of Manufacturers, p* 60)

Improved

G&W

High Voltage

POTHEADS

offer simplified design; lower cost

Simplification of G&W's original Type AT pothead design has resulted in lowering costs of the new high voltage pothead line, ATA-N and ATL-N. The outstanding mechanical and electrical characteristics which have been responsible for the fine performance of the original Type AT potheads have been retained. Maximum interchangeability of parts is one of the advantages gained by the simplified design. Also, the use of a straight-through type ferrule provides a more stable connection to the overhead line.

A new means of retaining gaskets is a definite improvement in sealing against high pressure. Successful tests up to 750 psig of hydrostatic pressure indicate that these improved G&W Potheads have superior performance characteristics under operating static heads in excess of 200 psig (nominal).

Type ATA-N and ATL-N potheads are another example of the constant improvement being made in G&W products. Their performance and dependability is based upon G&W's thorough understanding of electrical and mechanical requirements for cable accessories gained from 55 years of engineering development, testing, and operating experience. Consult with a G&W Representative on your present and future cable termination needs, or write us for full information.

G&W ELECTRIC SPECIALTY COMPANY

3500 WEST 127TH STREET • BLUE ISLAND, ILLINOIS

CANADIAN MFG. • POWERLITE DEVICES LTD. • TORONTO, MONTREAL & VANCOUVER

superior quality standards — inspired specialized design

AT60-1

Crapo GALVANIZED STEEL STRAND

WEIGHT OF COATING TEST

...added assurance of dependability

The life of galvanized steel strand depends primarily upon the weight and quality of the zinc coating. The heavier the coating the longer the strand will last.

The wire used in CRAPO Galvanized Steel Strand is regularly subjected to the hydrochloric acid antimony chloride, or weight of coating, test. By means of this test the amount of zinc on the surface of the wire can be accurately measured.

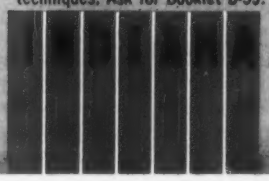
This is but one of the many laboratory tests to assure consistently high, dependable quality in the finished product.

AVAILABLE IN 3 COATING WEIGHTS

CRAPO Steel Strand is regularly furnished in all standard sizes and grades and in Class A, B and C coatings. Class B coating is twice as heavy as Class A coating; Class C coating is three times as heavy.

Write for this FREE BOOKLET!

"The Story Behind CRAPO Galvanized Wire and Strand" describes and illustrates manufacturing and testing techniques. Ask for Booklet B-59!



STEEL & WIRE CO., INC.
Muncie, Indiana

Color-Coded Insulation Used for Aerial Cables

Color-coded insulation will facilitate the application of a new line of duplex, triplex, and quadruplex aerial cables recently introduced by Southern Electrical Co, a unit of Olin Mathieson Chemical Corp. The cables were designed as service drops and secondary conductors.

Sizes range up to No. 4/0 in 7-strand all-aluminum and No. 1/0 to 350 MCM in 19-strand. The larger sizes were intended particularly for cable secondaries. Special processing during manufacture produces a compact stranding of shaped strands with negligible interstices. Thus, the finished cable has substantially reduced overall diameter and requires less insulating material. A No. 4/0 triplex, said C. M. Fredrickson of Southern Electrical, has 7% less OD and weighs 4% less than a conventional cable.

Insulation for the new 600-v cables is a vulcanizable synthetic rubber developed by E. I. du Pont de Nemours & Co, Inc. Known as chlorosulfonated polyethylene, it retains the chemical inertness, resistance to weather and moisture, and dielectric strength of polyethylene. The inclusion of chlorine increases its resistance to flame and makes it self-extinguishing, according to E. J. Strube of du Pont. And, as a thermosetting material, it resists abrasion, compression cutting, and heat damage, having a 90C rating from Underwriters' Laboratories. It can be compounded in white, black, and a variety of colors but, for secondary cable, black, gray, and an inconspicuous dull red will be used to help lineman identify phases.

GE Supplies Equipment For New A. B. Chance Lab

General Electric will supply power equipment for A. B. Chance's new short-circuit laboratory, Centralia, Mo., to test fuse cutouts, lightning arresters, circuit breakers, and circuit interrupters. Equipment includes motor-driven alternator capable of 3-phase short circuit of 762 Mva at ¼ cycle. Alternator connections and transformers provide various testing voltages.

(*More News of Manufacturers, p* 62)

QUALITY-SERVICE

Insuring top quality of all CADWELD Electrical Connection installations is the policy at ERICO PRODUCTS, INC.

Twenty CADWELD FIELD ENGINEERS continually assist new customers sold by the distributors throughout the country.

Here, R. G. Smith, CADWELD Southeastern District Sales-manager, personally instructs a construction crew foreman in CADWELDING a grounding grid system for a southern electric utility.

For the best in electrical connections—specify Cadweld

CADWELD®

electrical connections

ERICO PRODUCTS, INC.

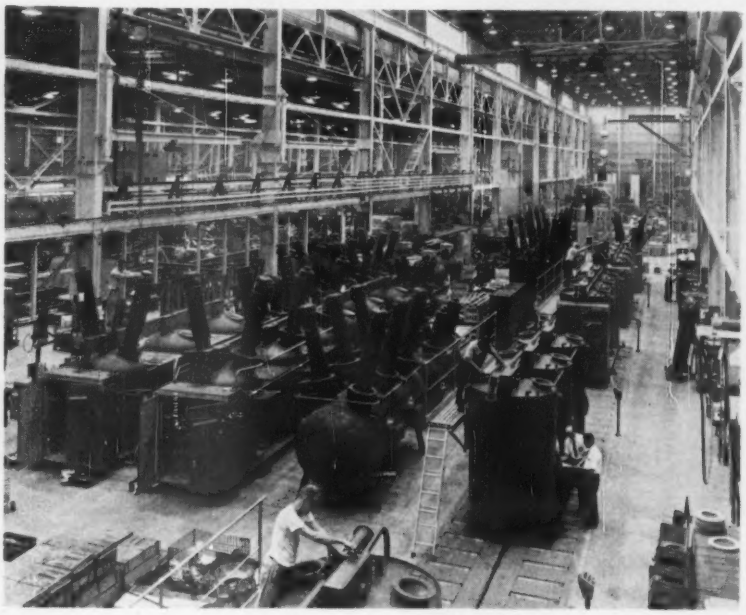
2070 E. 61st Place Cleveland 3, Ohio

Distributed in CANADA by

CLM Industries—Toronto 13, Canada

WE Unveils High-Voltage Circuit Breaker Facilities

High-voltage breaker production is under way in Westinghouse Electric Corp's new power circuit breaker plant at Trafford, Pa. This site was selected for easy access to the company's high-voltage and high-power laboratories, where new designs are proof-tested before adoption in standard production. Completion of the new 370,000-sq-ft plant is expected later this month, about 27 months after ground breaking.



HIGH-VOLTAGE OIL CIRCUIT BREAKERS, assembled on roller conveyor (right), pass through testing station at hanging sphere gap enroute to shipping docks at aisle's end. Lighter SF_6 and air-blast breakers are assembled on floor (left)

Conveyors and automatic machines are expected to boost the new plant's output at least 50% over that handled in about the same space in the old location, according to E. J. Gagliardi and W. W. Webber. The gain was attributed in part to use of a scale model to plan efficient flow of all components toward the final assembly and shipping aisles. Photos of the scale model served in lieu of drawings to guide the physical placement of machine tools and other facilities.

Layout was arranged to feed into three assembly aisles, one for floor-mounted breakers from 69 kv to the largest EHV designs, the second for frame-mounted units for applications between 14 and 69 kv, and the third for low-voltage breakers and accessories. All three lines flow toward the shipping docks at the rear of the plant. This planning is expected to pay off in reduced delivery times, shorter manufacturing cycles, and reductions in inventories and manufacturing costs.

MANUFACTURERS BRIEFS

Leeds & Northrup has received a contract from the city of Jacksonville for a new electronic brain to enable the city to produce more power from less fuel. The "advanced generation controller" will cut costs by maintaining each unit at its most economical operating level, regardless of load demand. It will also evaluate whether the city can sell power at a profit through a tie-line system with neighboring utilities. L&N claims similar installations have paid for themselves within one to two years.

Combustion Engineering has received orders from Consolidated Edison for two boilers which will generate steam for two 357-Mw turbine generators at the Ravenswood station, N.Y.C. The boilers will burn gas or oil initially. Provisions are being made for them to burn pulverized coal in the future. Steam will be supplied to the turbines at 1050F and 2250 psig, with reheat to 1000F.

Copperweld Steel is starting construction this month of a three-story office building in Glassport, Pa., which will house the wire and cable division's headquarters staff. Target date for completion of the building of about 15,000 sq ft, costing approximately $250,000, is the spring of 1961.

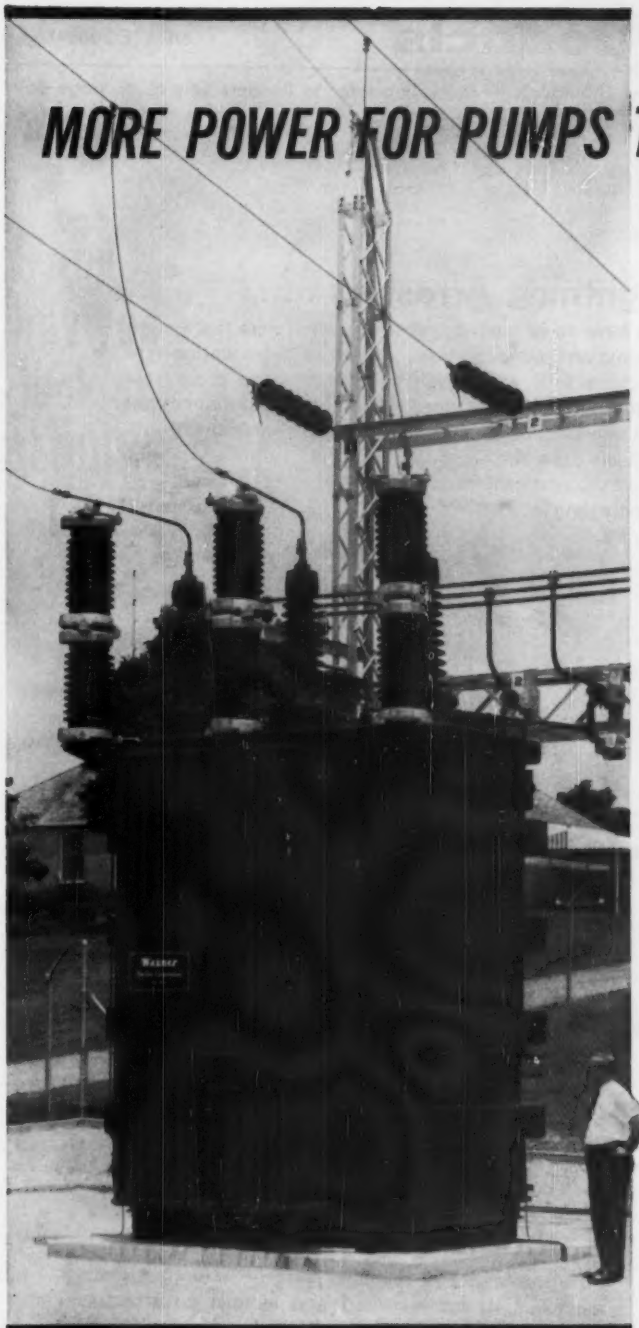
Westinghouse Electric has received an order from Toledo Edison for a $5-million, 135-Mw generating unit to be installed in the Bay Shore station. It is similar to two Westinghouse units now in operation at the plant. Total cost of the Bay Shore expansion, including boiler, condenser, and other auxiliary equipment, will be about $28 million—largest single project in the company's $66-million construction program for the next five years.

Aluminum Co of America has consolidated its research, development, and sales efforts for aluminum sheet and foil strip electrical conductors with a similar program of its subsidiary, Rea Magnet Wire. Rea has new duty of coordinating all Alcoa's activities for round copper and aluminum magnet wire, aluminum-sheet and foil-strip conductors.

Fluor Corp, Ltd, has received about $10-million contract from California Electric Power to engineer, handle materials procurement work and construct a 60-Mw unit for the Cool Water steam electric generating plant, located in the Mojave Desert, near Daggett, Calif. Unit #1, which Fluor also engineered and is constructing, will be completed by mid-1961.

(*More Procurement & Products, p* 64)

MORE POWER FOR PUMPS THAT PUSH PETROLEUM



THIS WAGNER TRANSFORMER

POWERS-UP

PLANTATION PIPELINE

The Plantation Pipeline Company pumping station at Neese, Georgia, is part of an underground transportation system that pushes high quantities of petroleum products to their market.

The Neese operation was originally served with power from a 44 kv system substation. However, the size of the pumping load—which includes some 1800 hp motors—became too great for the substation to handle adequately.

To better serve the load, Georgia Power Company recently installed a 110 kv line and built a new substation. Wagner Electric Corporation furnished the transformer rated at 7500 Kva for this purpose. Today, Plantation Pipeline pumps with full power.

Now, what about your power needs? If they present a critical (or even a potential problem), call your nearby Wagner Sales Engineer. He'll help you plan your power program . . . suggest Wagner transformers that will meet your needs for years to come. There are Wagner branches in 32 principal cities.

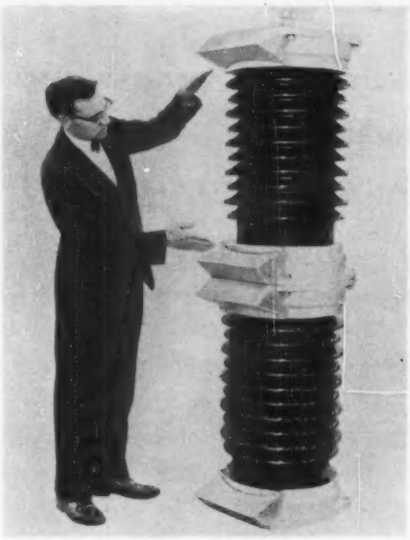
Wagner Electric Corporation

6456 PLYMOUTH AVENUE,
ST. LOUIS 33, MISSOURI

WT60-6

SERVING 2 GREAT GROWTH INDUSTRIES—*ELECTRICAL • AUTOMOTIVE*

(For further information refer to Readers Service on page 66)

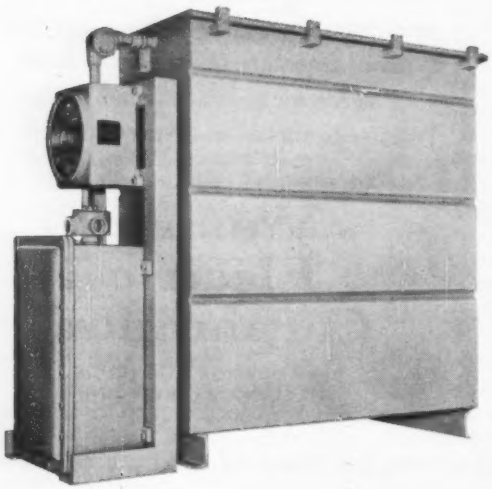


Lightning Arresters . . .

. . . have an improved pressure-relief system that guards against arrester explosion. If one of these station-type arresters fails in operation, high pressure gases vent at top and bottom through rupturable metal diaphragms and exhaust ports. The two converging streams of ionized gas draw the arc from the inside within a ¼ cycle, The exhaust port hoods are slanted to shed water.
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Converter . . .

. . . transfers data from punched paper to magnetic tapes at 150 characters per sec. The solid state IBM 7765 converts from most paper tapes, including IBM 8-track tape and widths of $\frac{1}{16}$, ⅞ and 1 in., to a 7-track Mylar magnetic tape with 200 characters per in. No air conditioning is required for the converter, which operates from 115-v supply.
International Business Machines Corp, 112 E Post Rd, White Plains, N. Y.

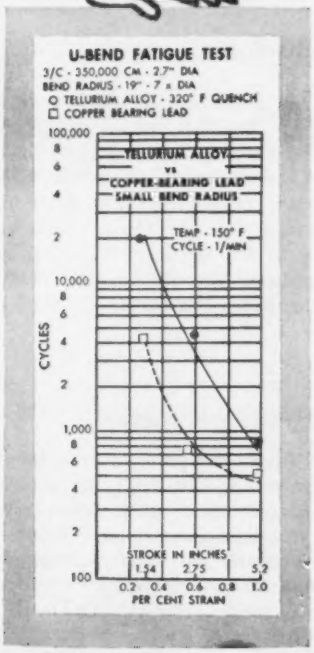


Cathodic Protector . . .

. . . automatically regulates current to protect against corrosion of underground and submerged structures. The Automatic Potential Control retards deterioration of coatings and conserves anode material. The device, which provides a continuous indication of the protective state of the structure and includes alarms to warn of system malfunction, can be adapted to existing cathodic protection or applied as new protection. Installation is tailored to environmental and climatic conditions.
Electro Rust-Proofing Corp, 30 Main St, Belleville, N. J.

(More New Equipment on page 66)

ROEBLING'S TELLURIUM LEAD ALLOY SHEATH LASTS 4½ TIMES AS LONG!



It's been proved in laboratory tests—the Tellurium Lead Alloy Sheath on Roebling Paper Power Cable has *4½ times more bending life* than copper bearing lead sheath! What's more, tests (and experience) prove this sheath has outstanding stability under heat... unusual resistance to age hardening... negligible creep rate at 200 psi, 150°F.

The paper power cable inside matches the extra quality of the sheath. And that's the whole story—there's simply no better cable buy, when the cable you use has to last, then last some more!

Test data and an informative folder about the exceptional properties of this sheath are available. Write: Electrical Wire, John A. Roebling's Sons Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation

Roebling electrical wires and cables are available with either copper or aluminum conductors.

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

Westinghouse . . Lightning Arresters ☐
IBM . . . . . Converter ☐
Electro Rust-Proofing Cathodic Protector ☐
GE . . . . . Post Insulator ☐
Alcoa . . . . . Dead-End Clamp ☐
Sel-Rex . . . . . Portable pH Meter ☐
Reliance . . . . . Open Motor ☐
Subox . . . . . Paint ☐

OTHER

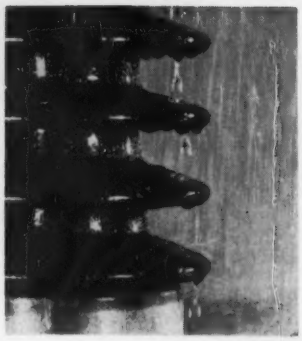
Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* Note: Requests must be received within four weeks of publication date, accompanied by complete information specified. This service cannot be offered to readers in foreign countries or to competitive manufacturers.

NAME_____
TITLE_____
DEPT._____
COMPANY_____
ADDRESS_____

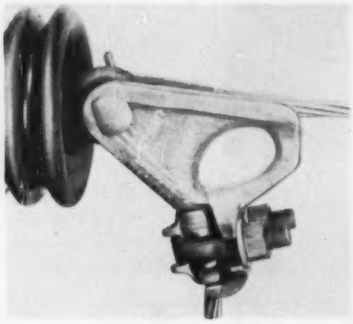
FOR:
Reference . . . . . ☐
Specs . . . . . ☐
Trial . . . . . ☐
Purchase . . . . . ☐

JULY 4, 1960



Post Insulator . . .

. . . has large spacing between insulator hoods to reduce water bridging and corona. Effective leakage distance is also greater. Ratings are 7.5 to 60 kv.
General Electric Co, Insulator Dept, Box 57, Baltimore 3, Md.



Dead-End Clamp . . .

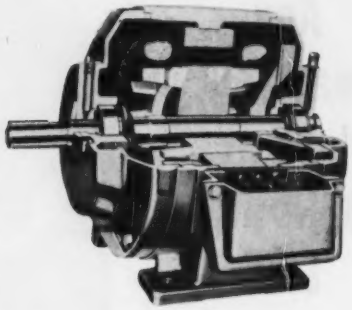
. . . of aluminum weighs less than ¾ lb. The 301 bolted dead end, which has a galvanized steel clevis pin, is for No. 6-2/0 ACSR wire. It has been tested in excess of the required 95% of rated conductor strength for all these ACSR sizes.
Aluminum Co of America, 1501 Alcoa Bldg, Pittsburgh 19, Pa.

Portable pH Meter . . .

. . . fits in the palm of your hand. Electrion is drift-free. It requires no warmup for operation and can be left in continuous service. A reference pointer and handy grounding connection are provided. Calibration is needed only weekly.
Sel-Rex Corp, Nutley, N. J.

Open Motor . . .

. . . is weatherproof. Stator windings are encapsulated in a class "B" thixotropic—it won't change form when hot—epoxy insulation. Ball bearings, lubricated by grease that is closely regulated, and other internal



parts are also protected. The line of Duty Master Weatherproof motors is furnished in ratings 1-125 hp at standard voltages and speeds.
Reliance Electric and Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio.

Paint . . .

. . . for corrosion protection can be brushed on in one heavy (3-4 mils thick) coat, hence saves manpower spent on applying two coats. "Double Coat" paints, which can also be sprayed over the primer coat, dry by air in 48 hours. Aluminum and heat resistant paints are also available.
Subox, Inc, Hackensack, N. J.

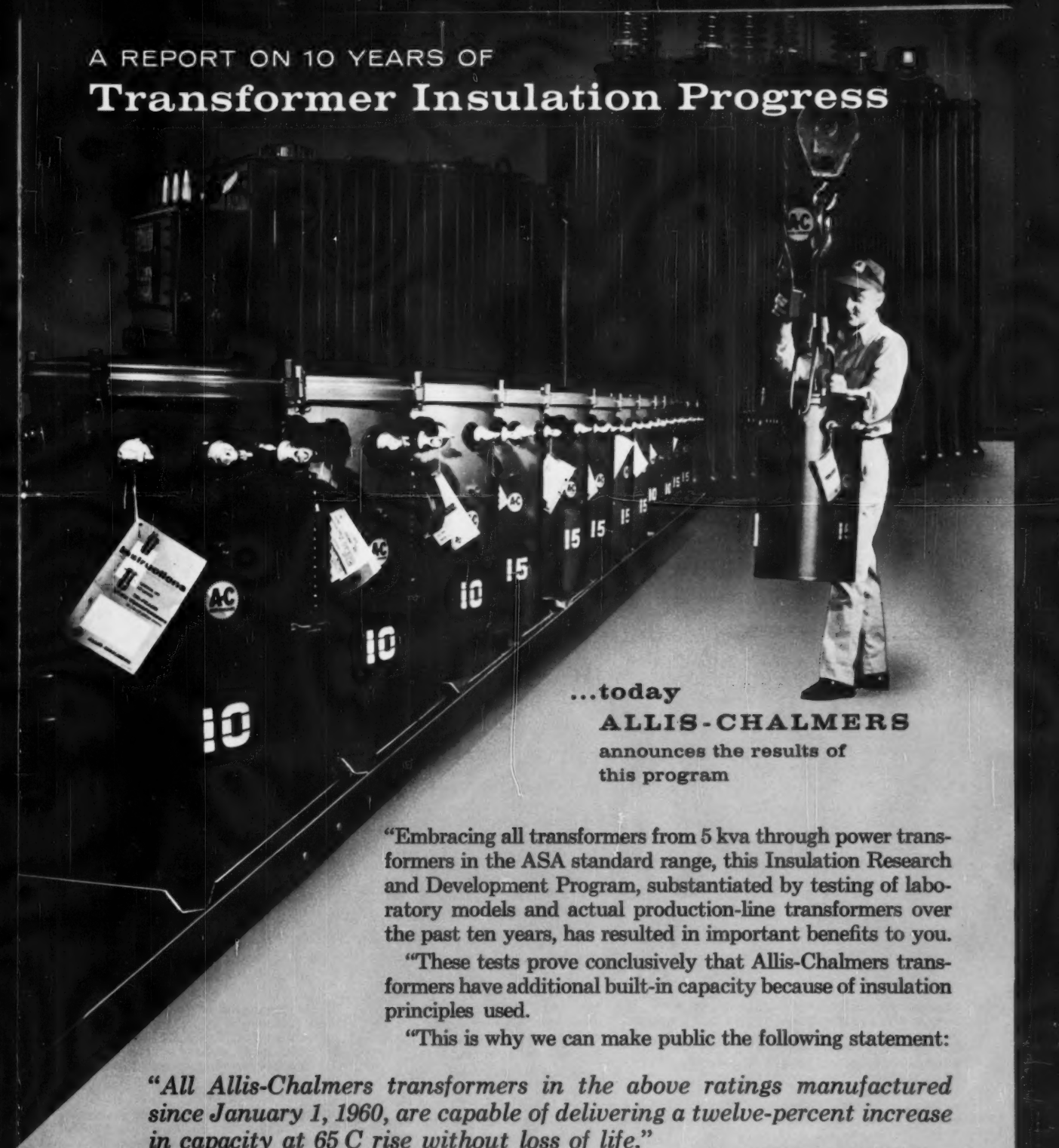
More New Products

Wiring devices resist corrosion, oils, greases, and most acids. Included for use with portable tools and equipment are 3-wire, 15-amp, 125-v grounding devices.—Harvey Hubbell, Inc, Bridgeport 2, Conn.

Air-powered hoist has several throttle and brake systems which make it adaptable for hoisting men and materials in many applications. Its lifting capacity ranges from 27,000 lb at 37 fpm to 3,700 lb at 220 fpm.—Joy Mfg Co, Oliver Bldg, Pittsburgh 22, Pa.

A REPORT ON 10 YEARS OF

Transformer Insulation Progress



...today
ALLIS-CHALMERS
announces the results of this program

"Embracing all transformers from 5 kva through power transformers in the ASA standard range, this Insulation Research and Development Program, substantiated by testing of laboratory models and actual production-line transformers over the past ten years, has resulted in important benefits to you.

"These tests prove conclusively that Allis-Chalmers transformers have additional built-in capacity because of insulation principles used.

"This is why we can make public the following statement:

"All Allis-Chalmers transformers in the above ratings manufactured since January 1, 1960, are capable of delivering a twelve-percent increase in capacity at 65 C rise without loss of life."

L. W. Long, Assistant General Manager
Power Equipment Division

Allis-Chalmers will furnish upon request and without charge, supplementary nameplates showing the 65 C rating on all above transformers now in customers' hands.

ALLIS-CHALMERS

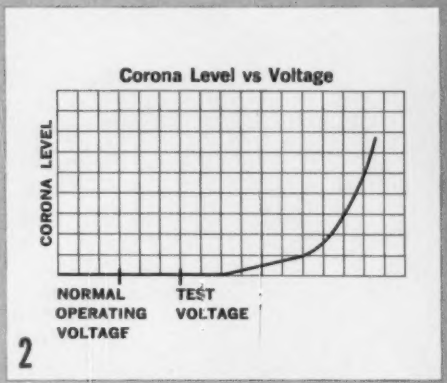
A-1351

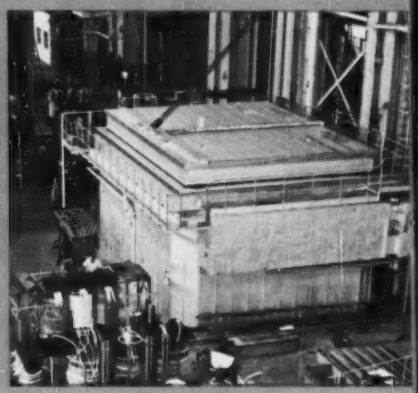
A REPORT ON 10 YEARS OF
ALLIS-CHALMERS TRANSFORMER
INSULATION PROGRESS

Proof of Transformer Endurance

Load tests on actual transformers at copper temperatures from 105 C to 230 C, running continuously for over three years, completely substantiate the 65 C rise rating when the following basic factors are employed!

3 major factors influencing Allis-Chalmers transformer endurance





1 **Thermal compatibility of insulating materials** — Investigation has shown that two insulating materials, each meeting the same rigid requirements of a material specification, will behave differently when incorporated into an insulation system. Interaction of oil and other insulating materials can improve or destroy the system performance.

Allis-Chalmers has — through accelerated tests on many laboratory models plus long-time tests on completed transformers:

a — used only basic insulating materials

b — eliminated those materials showing a basic weakness in a system, even though they meet the material specifications

c — tightened material specifications

• • •

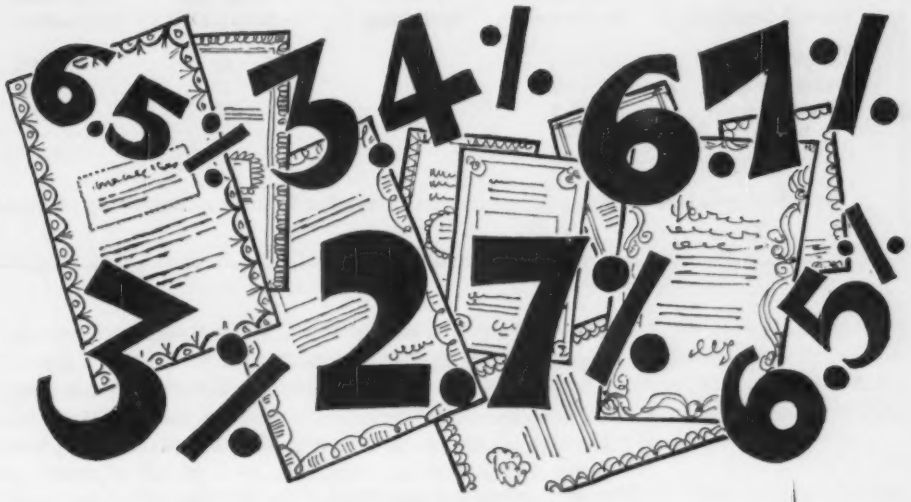
2 **Corona-free design** — Corona, the cancer of electrical equipment, is an electrical discharge which rapidly deteriorates the system through carbonization of the insulation and thermal breakdown of the oil. Based on measuring techniques and instrumentation developed by our engineers, design criteria have been established. Allis-Chalmers transformers are designed (and substantiated by tests) to be **entirely free of corona** not only at operating voltage, but **at all test levels.**

• • •

3 **Controlled processing** — The elimination of air and moisture has a very important effect on insulation life. Tests have shown that moisture content as low as twenty parts per million can cause insulation breakdown. Allis-Chalmers transformers are processed to give completed units an uncontaminated system.

ALLIS-CHALMERS

Power Equipment Division, Milwaukee 1, Wisconsin



A New Look at the Cost of Capital

Report on Finance

Not long ago, many businessmen were comfortably certain they could easily figure the cost of common capital. It was a simple matter, they reasoned; just find the earnings-price ratio of a company's common stock. But today there are some uncomfortable doubts in professional circles. A growing faction now insists that earnings-price ratios, traditionally relied upon, are no longer a valid guide to the true cost of common stock. They reason that the lure of higher future earnings is actually part of the compensation now attracting common money from investors. And these higher future earnings must be considered part of today's cost of capital.

What's wrong with the traditional approach? "With a typical public utility capital structure this would mathematically produce, under today's conditions, an overall cost rate of about 4½%, which seems obviously ridiculous," remarked Charles Tatham, of Bache & Co, recently. Tatham, who manages the public utilities department for the New York investment banking firm, spoke before the Investment Officers Association of the Savings Banks of New York. His method for arriving at what he considers the correct cost of common capital is both simple and logical for those who share his views: **(1)** *Use earnings-price ratio* to find the cost rate on common, then **(2)** *weight the common stock component of capitalization* to reflect the market price premium over book value for several preceding years.

The conventional method, using earnings-price ratios alone, seems to justify rates of return so low that intelligent financial people instinctively reject them as either punitive or confiscatory, Tatham believes. These people may even reject the whole concept of cost of capital as a guide for establishing a fair rate of return. And they reject it without stopping to ask whether it is not their *method* of computing cost of capital that is wrong, and not the *concept* itself. Such a blanket rejection of principles serves little purpose. It simply isn't persuasive to the commissions, which, invariably, go right on using cost of capital in their rate decisions.

"As I see it, the cost of capital is similar to the cost of anything else," Tatham said. "It is the price the buyer has to pay in order to persuade the owner of capital to

To find cost of capital, use earnings-price ratios alone . . .

Capital Structure	Percent Proportion	Weighting	Weighted Proportion	Cost Rate	Composite Cost
Long term debt.....	50	1	50	4.5%	2.250%
Preferred stock	15	1	15	5.5	0.825
Common stock	35	1	35	8.3*	2.905
	100				5.980%

*Based on average earnings-price ratio of 7.4%, plus 10% for underpricing. Figures are illustrative only.

part with it." The market for capital is a highly competitive one, with seekers of capital bidding against one another for the investor's favor. The investor is under no compulsion to make his capital available to any one company. He does so only if his compensation or return is adequate for the risk he takes. Thus, to maintain the high quality of electric utility securities a continuing level of adequate earnings is absolutely essential. And this, in a period of rising costs, means companies must present realistic cost of capital figures in rate cases. Rate regulation is, after all, earnings regulation, Tatham said.

The cost of common capital is also determined by what an investor expects in the way of future compensation. The investor takes a risk. He has no guarantee that he will get a specific return at a specific time. All he is entitled to are the residual earnings left over after all operating expenses, including the cost of senior capital. These future residual earnings will represent his compensation. And by the same token, Tatham believes, the cost of common money is determined by what an investor expects in future earnings at the time he contributes his capital to the business.

Why aren't dividends the company's cost of common? Actually, the dividend is only part of a stockholder's compensation. Some companies pay no dividends at all on their common stock. Such companies might be so profitable, or promise to become so profitable, that it is to a stockholder's advantage to leave all his earnings in the business. The retained earnings increase the value of his investment as the business expands. But the fact that no cash dividends are paid in no way means a company has acquired zero-cost capital. Nor does it mean the stockholder has put up his money without expecting anything at all in return. It means simply this:

- *Expected future capital appreciation is an element in the current value of the common stock of a growing company, and is rightly considered as part of the compensation that attracts common stock money.*

- *Only by relating an investor's expectation of future earnings to the price he is willing to pay for the stock can we come up with the correct figure for the cost of common stock money.*

The conventional method of measuring the cost of common has been to use the earnings-price ratio. In other words, the ratio of a company's earnings (profits) to the market price of its stock, expressed as a percentage. It is the inverse of the more familiar price-earnings ratio. Thus, if a stock is selling at 20 times earnings, the earnings-price ratio is 5%. This 5%, with certain minor adjustments, is said to represent the cost of common stock *at the time it is calculated.*

The error, Tatham believes, lies in the assumption that 5% is actually the cost of

Capital Structure	Percent Proportion	Weighting	Weighted Proportion	Cost Rate	Composite Cost
Long term debt.....	50	1	50.0	4.5%	2.250%
Preferred stock	15	1	15.0	5.5	0.825
Common stock	35	1.6**	56.0	7.4	4.144
	100				7.219%

**For average 60% market price premium above book value.

common capital. "When an investor buys a stock at 20 times earnings it certainly doesn't mean that he will be satisfied with a 5% rate of earnings. All it means is that he is willing to pay 20 times current earnings for what he expects to receive in the future. And we can be virtually postive that *he expects to receive a great deal more than 5%.*"

An earnings-price ratio is actually a measure of investor confidence. When a company's earnings-price ratio is low it indicates that investors expect higher future earnings. When it is high, it shows investors don't have confidence in a company's ability to sustain its earnings at the level of the recent past.

Low earnings-price ratios certainly don't mean investors are willing to supply equity capital at a permanently lower rate of return, Tatham pointed out. They merely mean that investors are optimistic about the future, and are willing to pay a premium for a stock today that will show higher earnings later on.

"Despite this," Tatham remarked, "many people appear to believe that the cost of common stock money is, in fact, very low today. Opposition witnesses in utility rate cases almost invariably assume this and use it as an argument in their efforts to hold down rate increases."

Cost of Capital in a Typical Rate Case

The vast majority of rate case witnesses on rate of return subscribe to the traditional method of measuring cost of common money. That is, they use earnings-price ratios as a final guide. This common money cost is added to the cost of debt (interest rate) and the cost of preferred (fixed dividend rate) to arrive at an overall cost of capital. This becomes the commission's major guide in determining what rate of return a utility should earn on its plant and equipment. But this figure, the overall cost of capital, usually appears too low, and commissions generally revise it upwards by introducing a "fudge-factor"—that is, by pure guesswork. Tatham believes his method, giving common capitalization a higher weight according to market price premium above book value, will **(1)** eliminate this "fudging," and **(2)** permit a more realistic figure for cost of capital; one which is not much higher than with the traditional method. Here is an example.

The traditional method of arriving at cost of capital is shown on page 70. The 8.3% cost rate for common is calculated by **(1)** taking a five year average of earnings-price ratios, in this case 7.4%, and **(2)** adding a 10% adjustment to cover the costs of distribution and underpricing (a discount below market price intended to induce investors to buy the new shares). To arrive at the overall cost of capital, the cost rate of each kind of security is multiplied by the proportion it represents in the utility's total capitalization (as shown in the company's balance sheet). Here, the overall cost is 5.98%.

But this 5.98% figure is wrong, according to Tatham, because the computed cost of common stock money fails to account for earnings growth expectations.

The "correct" method of computing cost of capital appears at the top of page 71. The company's capitalization is the same, but the common stock component has been weighted by 1.6. In other words, the common stock portion of capitalization is considered as being 60% greater than its balance sheet book value. Why use 60%? Because that is the average market price premium over book value that prevailed over the five year period from which the 7.4% earnings-price ratio was determined. By this method, the overall cost of capital is seen to be 7.2%. This 7.2% figure is correct for the conditions assumed, Tatham believes, and *is approximately the cost of capital for a typical electric utility today.*

This method, Tatham says, provides as accurately as possible for the future earnings investors expected when they established the price level they were willing to pay. For example, if a stock is, and has been, earning 10% on book value, that is about the rate of earnings investors expect in the years ahead. If an investor pays a price 50% above book value, that means he expects earnings to increase 50% sometime in the not-too-distant future. And at that time, earnings will amount to 10% on the price he paid for the stock originally.

Rejection of the Method—But Not of Its Results

"While the use of this weighting adjustment appears to me to be extremely simple and supremely logical," Tatham said, "I must confess that it has not met with ready acceptance. I have used it in a number of rate cases and the general reaction has been to reject the *specific method,* but to give substantial weight to the *result it produces.* To a considerable degree, I think that this reflects the normal human tendency to view with suspicion new procedures in an area where the conventional methods appear to have worked satisfactorily."

The important point is this, Tatham believes: The conventional method of computing cost of common capital simply will not continue to work satisfactorily; particularly when utility common stocks are selling at market price premiums of from 70% to 150% above book value.

Why won't it work? Because, as some opposition witnesses in rate cases have candidly admitted, the traditional method is designed to produce an earnings level that will support utility common stock prices at no more than 10% above book value. Thus, after financing costs and underpricing, new common shares could be sold for no more than book value. "But that's all right," the opposition says. They reason that, if a stock has been selling fairly consistently at 15 times earnings (an earnings-price ratio of about 6.7%), it will sell at approximately book value if a commission takes steps to restrict earnings per share to 6.7% of book value. This 6.7% rate of return, they say, is all that investors in utility common stocks are entitled to.

If these people succeed in restricting earnings so that new common would sell at no more than book value the effect on the industry would be catastrophic, Tatham believes. If this happens, a most important factor contributing to per share earnings growth would be eliminated. As long as new common can be sold for more than book value, the per share book value of the old shares is increased every time a new share is sold. This permits higher per share earnings, even though the overall rate of return does not increase.

This possibility of increasing per share earnings is of vital importance to investors. If it were eliminated, utility equities would lose a major part of their investment appeal. "Under these circumstances," Tatham remarked, "it is highly questionable whether informed investors would continue to supply equity capital to the industry."

Crosley Field, Cincinnati, 25 years ago,

and today, shows

Ball Park Lighting Progress

The cry of "Play ball!" may be heard in more and more cities around the country in the future. With discussions of expansion in the major leagues, and the advent of the Continental League, bigger and better ball parks, with improved lighting, will be springing up across the land. The trend also is to more and more night games. All this means increased, off-peak, load for utilities.

Night baseball came into being on May 24, 1935, at Cincinnati's Crosley Field. Today, the newest, well-lighted, ball park is the San Francisco Giants' Candlestick Park.

When President Franklin D. Roosevelt pushed a button in the White House in 1935 to start the major's first night game, 632 lamps were lighted at Crosley Field. Today the park has eight light towers with a total of 780 1,500-w bulbs.

Total load is 1,300 kw, and lighting at field level is 100 ft-c.

Out in the Bay City its new sports stadium has eight towers with 1,147 1,500-w floodlights mounted approximately 223 ft above the playing field.

Mercury vapor floodlights on tapered steel poles illuminate the 60-acre parking field.

Other electrical facilities include special lighting treatment, air conditioning, and electric heating in the executive offices, lobbies, and dressing rooms for vendors.

Pacific Gas & Electric Co said it practices "overburning" in the lighting fixtures by charging them with more current than is specified. Thus, installation costs are lower, the lights burn brighter, even though maintenance costs are higher.

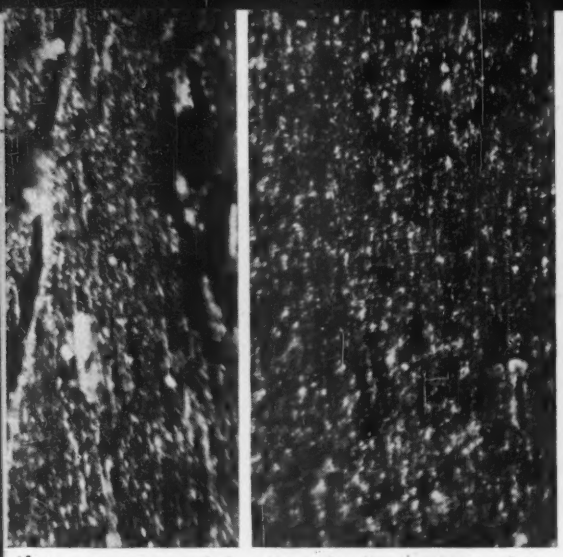
Total energy used for the period April 11 to May 10, including four night games, was 115,200 kwhr. Peak demand was 2,448 kw, with a connected lighting load of 2,085 kw for the field and parking area.

Infra-red Lamps Beat Big Freeze

A problem which can occur at the end or beginning of the baseball season, or for football, was licked at Briggs Stadium, Detroit, with infra-red tubes. Ground conditions were unusually severe in the spring. Before opening day, ice and snow were piled 3 in. thick between third and first base, home plate and the pitcher's mound.

To "blast" this, a wagon-shaped platform was built with 48 infra-red ray tubes mounted under it. The tubes blasted the ice with devastating effect. They turned ice to water and that to steam, defrosting the ground an inch below the surface.

A 9x20-ft area was cleared in 45 minutes. As soon as one spot was thawed out the platform was moved to another. It cost only $2.40 an hour to operate the lamps with energy supplied over two 300-ft cables.



Above you see magnified sections of ordinary cable insulation (left) and Anaconda Butyl (AB) Cable insulation (right).

These screens, used in the extrusion head to entrap possible contaminants, are so fine they actually hold water.

TWO BIG REASONS WHY ANACONDA BUTYL (AB)

1. SPECIALIZED DEVELOPMENT

Because Anaconda was the first to develop butyl-insulated cable—and because butyl handles differently from other rubbers—many problems came up during development. Here are some examples—and how Anaconda engineers solved them.

A mixing problem: Like all raw rubbers, butyl in its raw state is a practically useless material. So it's mixed with specially selected additives and ingredients. Because it is very difficult to disperse these ingredients in butyl, Anaconda had to develop an entirely new mixing process and separate facilities to avoid contamination. Look at the comparison photos and see how successful it is.

A shielding problem: To eliminate laborious and time-consuming cleaning of insulation surfaces, Anaconda developed a semiconducting tape* which firmly adheres to the insulation—and yet is easy to remove during splicing and terminating.

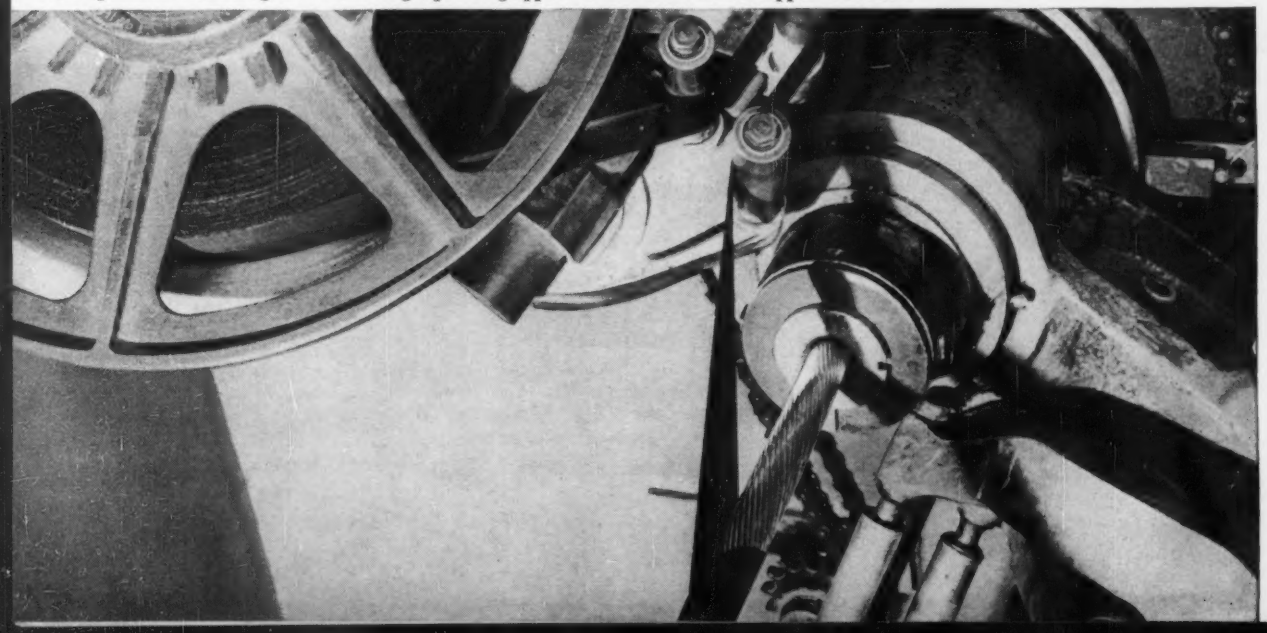
Even a vulcanizing problem: Ordinary vulcanizing equipment might have a tendency to deform butyl insulation. So Anaconda developed huge vulcanizing tanks which admit steam faster, vulcanize quicker and eliminate distortion.

These few examples show you the types of problems Anaconda engineers were up against. Their solutions help show you why you can be sure Anaconda Butyl (AB) Cable is the finest cable you can buy.

2. SPECIALIZED MANUFACTURE

Anaconda's new Marion Mill was designed to handle only one product—Anaconda Butyl (AB) Cable.

Close-up of semiconducting strand-shielding tape being applied to 500-Mcm tinned copper conductor.



An Anaconda development—semiconducting tape—adheres firmly to insulation, yet removes easily, facilitating splicing and terminating.

MEANS RELIABLE HIGH-VOLTAGE CABLE

The men behind this highly specialized equipment have but one job . . . to study and improve the design and manufacture of rubber-insulated high-voltage cable. Here are a few of the many places where they built precision right into the production line.

Insulation purity: For extra protection against contamination, the unvulcanized Anaconda Butyl is passed through a series of screens, one of which is so fine it will hold water.

Strand-shield taping: For better equalization of internal electrical stress, Anaconda applies a special fine-mesh semiconducting tape under the insulation of all stranded high-voltage cables.

Vulcanizing in lead: Conventional lead presses must stop periodically for refilling—severely heating up and often damaging the cable section in the die block, so Anaconda extrudes lead continuously. In the next step, exceptionally large drums are used for vulcanizing in lead to eliminate distortion of jackets and insulation.

These few examples help show you that the manufacture of Anaconda Butyl (AB) is highly specialized, highly precise—and why Anaconda offers you the big advantage of consistent high quality.

*Pat. applied for

ASK THE MAN FROM

ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

Huge reel entering large vulcanizing tank which vulcanizes cable quicker than conventional methods, eliminating distortion of insulation.

Hutcheson Elected VP of VEPCO

R. M. Hutcheson has been elected a vice president of Virginia Electric & Power Co. T. Justin Moore Jr has been named associate general counsel.

An electrical engineering graduate of Virginia Polytechnic Institute, Hutcheson joined VEPCO in 1927. Since then he has held numerous positions in the company's power department. He was named manager of that department in 1955.

Moore was appointed assistant general counsel of the power company in 1958. Before that he was associated with the law firm of Hunton, Williams, Gay, Powell & Gibson.

Rogoff Named Executive VP; Heller, Division Manager

ROGOFF

HELLER

Julian Rogoff has been named to be executive vice president of Burndy Corp. Succeeding Rogoff as manager of the Omaton Division is Fred Heller.

Rogoff joined Burndy in 1930 after graduating from New York University with a degree in mechanical engineering. He was named assistant chief engineer in 1939, chief engineer in 1947 and vice president in 1955. He was then named head of the Omaton Division in 1956 when it was organized to serve the electronic and electrical manufacturing markets.

A member of the Burndy Board of Directors since 1947, he is a member of the American Institute of Electrical Engineers. Also, he has been issued over 30 patents, mostly on electrical connectors and special fuses.

Heller went with Burndy in 1948, and after holding a number of executive engineering positions was named engineering manager and then production manager of the Utility-Industrial Division. He was then made assistant division manager of the Omaton Division.

He is a member of the American Institute of Electrical Engineers where he has been active on a number of technical committees. He is also a member of the American Institute of Industrial Engineers.

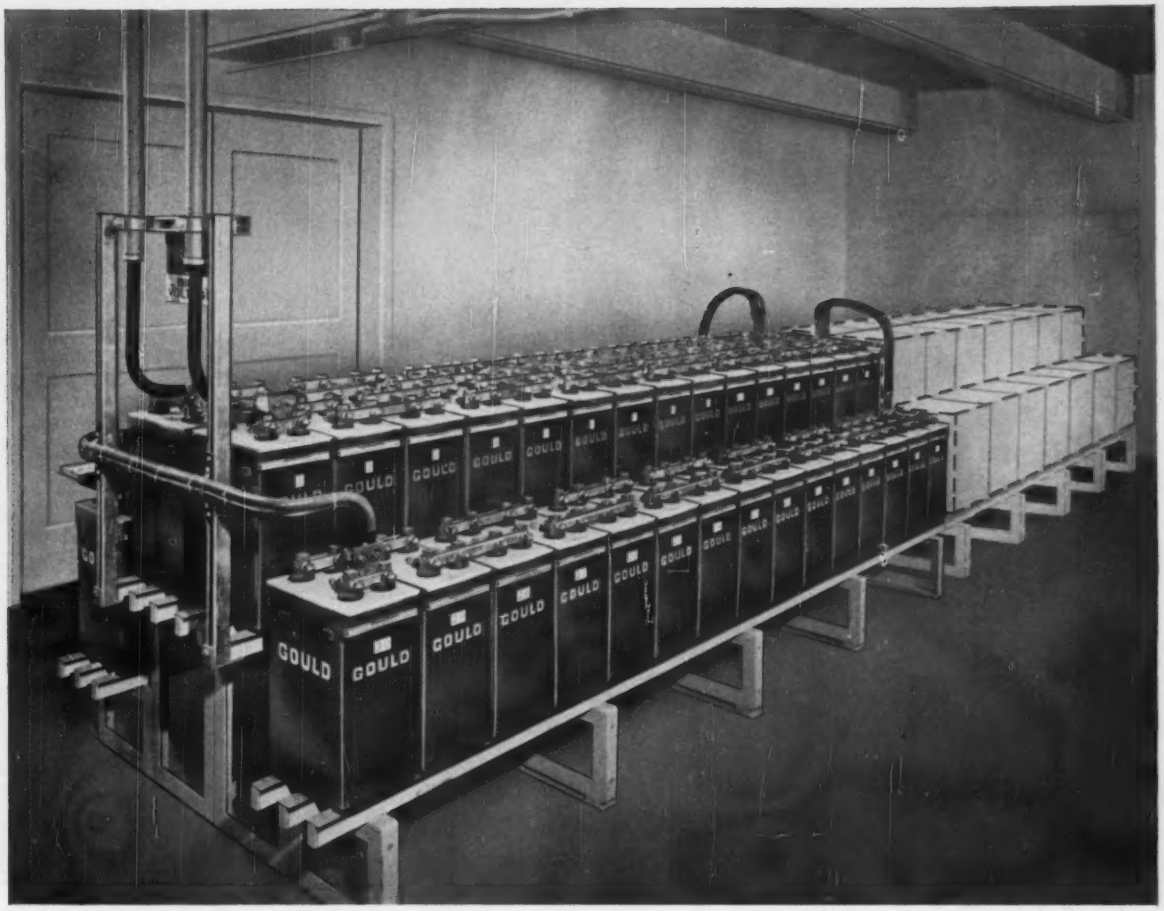
Kaiser Named a Vice President

Fred Kaiser has been appointed to the newly created position of vice president of Minneapolis-Honeywell Regulator Co's nine-state eastern sales region.

Kaiser has been manager of the region since 1953 and will continue to handle responsibilities of that office.

He has been with Honeywell for 30 years. Before becoming manager of the eastern sales region, he was national field sales manager for the company.

(*More News About People on page* 80)



Save 30 to 40% floor space . . .

. . . with new GOULD Stationary Batteries

Gould Stationary Batteries in Plastrite Jars save you 30 to 40% floor space. This means you can increase your battery room capacity without increasing the room size!

Gould Stationary Batteries in Plastrite Jars are lighter, easier to handle. Higher tensile strength protects the jars from shipping abuse. Higher elongation characteristics, greater resistance to heat prevent warping and bulging.

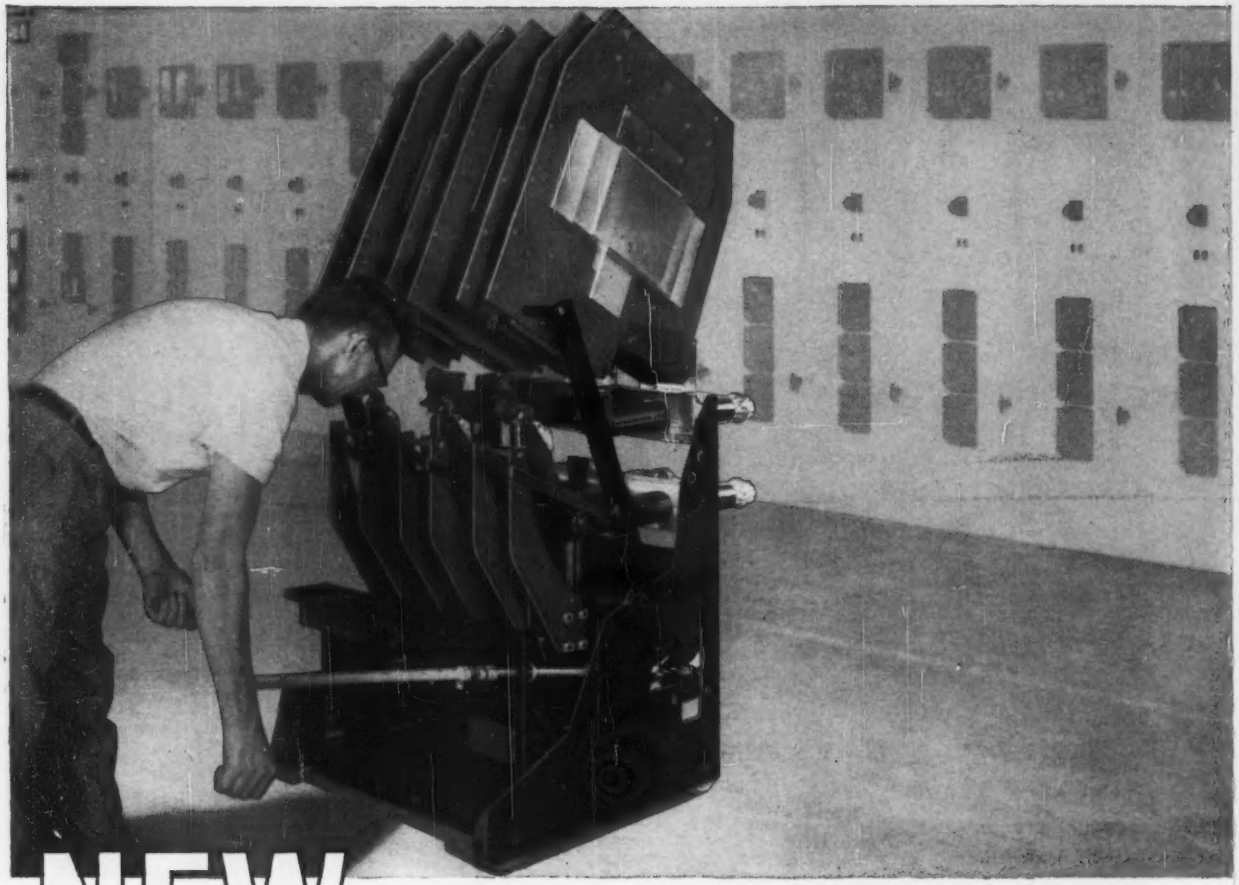
Gould Stationary Batteries have a new Silicone O-ring post seal which prevents escape of electrolyte . . . new stronger posts assure full current carrying capacity . . . new element suspension eliminates cover breakage due to weight of battery element.

Gould Stationary Batteries in Plastrite Jars are available in Planté, Calcium, or Kathanode. Write for details today, or call your local Gould office listed under "Batteries—Industrial" in the Yellow Pages. Gould-National Batteries, Inc., Trenton 7, N. J.

In Canada, write to Gould-National Batteries of Canada Ltd., 1819 Yonge Street, Toronto, Ontario.

New Stationary Batteries in Plastrite Jars offer the same long life for which Gould has always been famous.

More Power to you from **GOULD**



NEW...

HINGED ARC CHUTE of type DH magnetic air circuit breakers permits tilting of chute for full accessibility of arc chute interior and contacts for inspection. ISOLATED CENTER COIL design employed in the DH breaker arc chutes provides more efficient arc interruption.

DH BREAKER ADVANCES EXPAND CAPABILITIES OF METAL-CLAD SWITCHGEAR

Greater margins of safety and increased convenience of operation and maintenance . . . available with recent design advances in Westinghouse metal-clad switchgear

The HINGED ARC CHUTE of DH breakers affords ease of handling and facilitates inspection of arc chute interior and contacts. On smaller DH breakers, the arc chutes are tilted directly by hand. On larger breakers, the arc chutes are tilted by a compact, lightweight auxiliary device operated through the levering-in mechanism.

The ISOLATED, CENTER COIL DESIGN employed in the arc chutes of DH magnetic air circuit breakers permits more efficient arc interruption for any rating. This center coil design provides better magnetic field distribution . . . better insulation . . . increased field strength—all resulting in superior DH breaker performance.

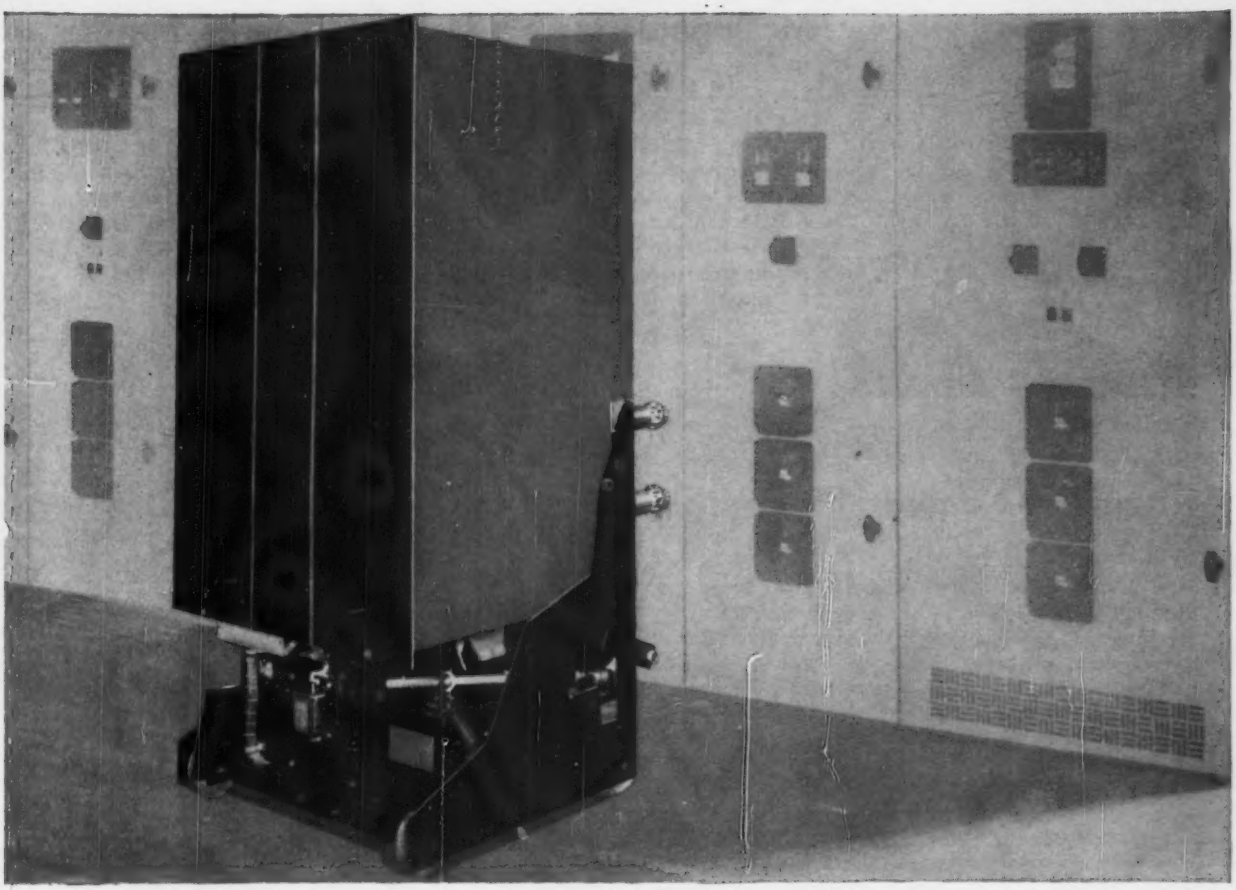
LIMITRAK* INSULATION SYSTEM, a recent Westinghouse development, provides superior, balanced insulation in metal-clad switchgear. *Limitrak* glass polyester is used on DH breaker arc chutes, end channels and supports. *Limitrak* coating is employed on DH breaker bushings. *Limitrak* design is incorporated on porcelain bus supports of the metal-clad switchgear housing. Westinghouse *Limitrak* has been proved by test to be 300 times more track resistant than ordinary grades of glass polyester, and is also highly flame retardant. Get complete information on these Westinghouse metal-clad switchgear developments from your Westinghouse representative. *Trade-Mark

Quality Westinghouse metal-clad switchgear offers more value in continuity of service and economy of operation

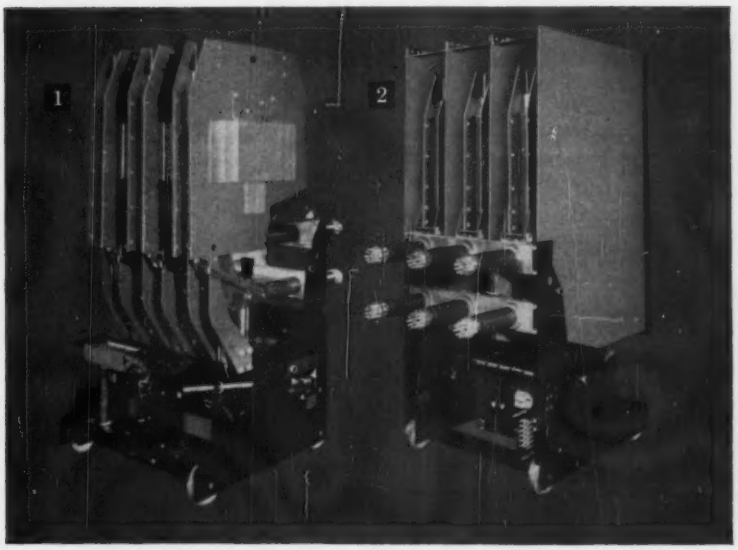
YOU CAN BE SURE...IF IT'S

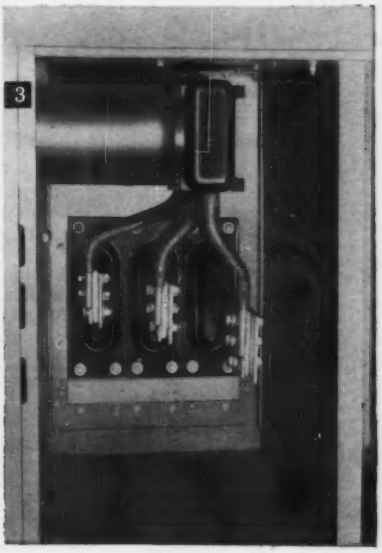
Westinghouse

Tune in Westinghouse-CBS TV-Radio Coverage, Presidential Conventions, July 10-29



Completely assembled DH breaker, ready for installation in the metal-clad switchgear stationary structure.





Limitrak Insulation System is employed . . . 1 On DH breaker arc chute sides, end channels and supports. 2 On DH breaker bushings. 3 On bus supports of metal-clad switchgear housing. J-60975

McDonald Named Manager-Marketing

James M. McDonald has been appointed manager-marketing at General Electric Co's medium transformer department. He succeeds Robert B. Ames who has been named manager of voltage regulator engineering.

McDonald had been manager—sales for GE's distribution transformer plant in Hickory, N. C., since October, 1956. Prior to that he served as transformer specialist in the Atlanta, Ga., apparatus sales office, and as manager of the Columbia, S. C., sales office.

Kitzmiller Named LBE Coordinator

Frank Kitzmiller Jr has been appointed to the newly created position of inter-industry coordinator for the Live Better Electrically Program.

Kitzmiller will be responsible for coordinating utilities, manufacturers and trade allies to encourage use of LBE's "Flameless" theme and slogan, "You Live Better Electrically."

He has been with EEI for 12 years, and before that was with Duquesne Light Co.

PERSONAL BRIEFS

Arizona Public Service Co has named **Max R. Llewellyn** to manager of gas and electric operations; **George Carlin** to manager of system overhead lines; and **Kenneth Hood** to manager of system electric equipment.

Robert P. Lee is now assistant to the vice president, public and employee relations, at Connecticut Light & Power Co.

Montana Power Co has chosen **Margaret Sullivan** assistant secretary.

George Huster has been promoted to assistant supervisor of meters, relays and communications of the Pacific Power & Light Co's Portland, Ore., offices. **Fred Rowell** replaces him as Walla Walla district power superintendent.

Raymond P. Dame has been promoted to Narragansett Electric Co's junior designing rank in engineering; **Phineas S. Barnum** to chief chemist; and **Fred Daft** to results engineer.

W. Robert Moody, electrical engineer at Utah Power & Light Co, has been elected president of the Utah section of American Institute of Electrical Engineers.

McGregor Smith, chairman of Florida Power & Light Co, has received an award as one of four Floridians who have contributed to the agricultural development of the state.

Quebec Hydro-Electric Commission has named **Charles H. Pigot,** assistant chief engineer, and **Yvan Hardy,** office engineer, of the Power Development Division. **James D. Altimas** has become manager of the service department and **Raoul Girard** its metering engineer, while **Pierre Godin** has been appointed system operation engineer of the Regional Operation Division.

Union Electric Co has named **J. Eugene Johanson** sales manager; **George R. Murray,** assistant secretary, and **Harry E. Wuertenbacher Jr,** executive assistant.

Georgia Power Co has named **Josh N. Kirksey** local manager of the Buena Vista office, succeeding **H. O. Harpe** who has transferred to be manager of the Greenville office.

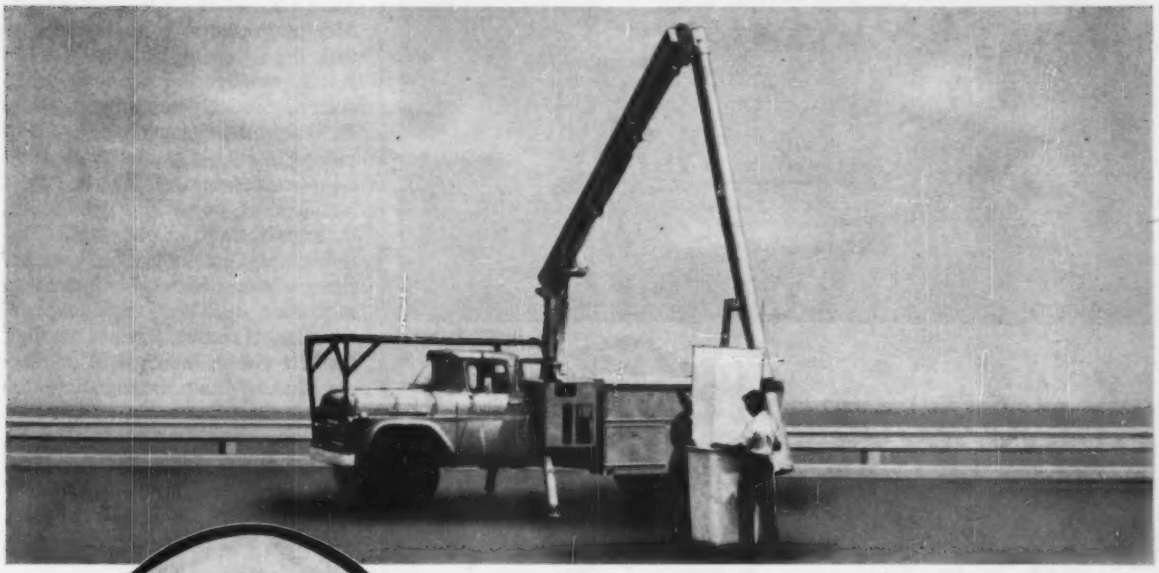
Thomas W. Martin, chairman of the board of Alabama Power Co, was honored by Edison Electric Institute at its annual convention for "his outstanding contributions to the electric power industry and to the industrial, civic, cultural and human welfare of his native state of Alabama, of the South, and nation."

BASKET LINERS

Eliminate difficult basket tests

Dielectric safety is assured for the man in the aerial basket by the use of the newly developed Insert Liner. Eliminated is the costly and difficult task of a scheduled testing program on the basket itself. The liner, easily removed, makes it simple to maintain the necessary testing program for dielectric safety.

Every Asplundh Liner is tested by an independent testing laboratory and certified to 50,000 volts, or higher if desired.



Four ways you benefit

when you use an Asplundh Insert Liner

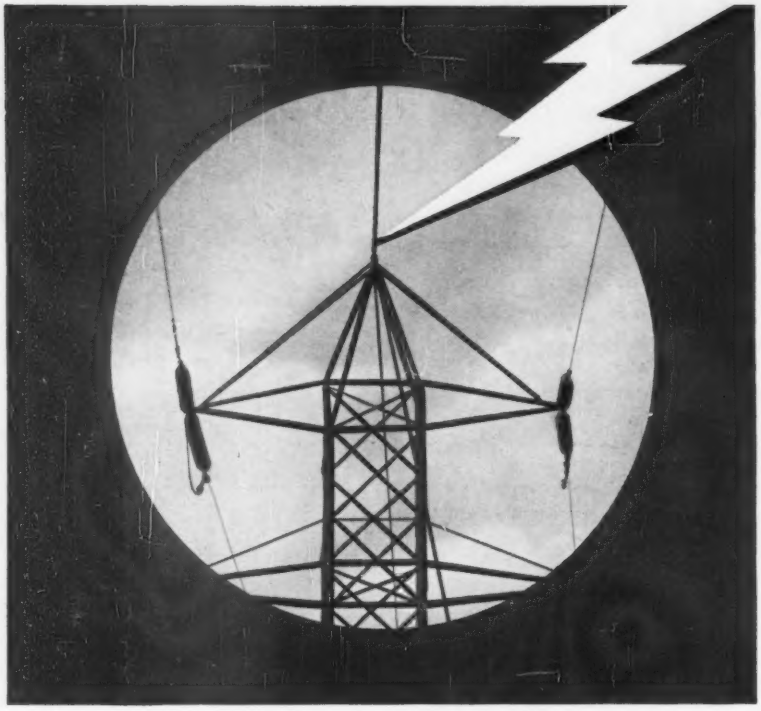
- No need to test the basket—test the liner only, keeping the lift in continuous use.
- Liners are inexpensive; keep an extra one available.
- Simple to store and easy to handle. Insert in a matter of minutes, no tools needed.
- Remove any water by simply emptying liner, thus saving time and inconvenience.

Remember, dielectric safety is yours with the "Big 3"—the **SPIRALLOY** Boom—the **SPIRALLOY** Pylon Mast Insert—and the Basket Liner—but only through Asplundh —most advanced designer and user of aerial devices.

Another important improvement by Asplundh, where "Future Developments" are Produced Today!

ASPLUNDH **Chipper Company**

501 York Rd., Jenkintown, Pa.



You're on the Safe Side with

CF&I Galvanized Steel Strand

Galvanized Steel Strand is a proven material for grounding power transmission lines. The wire used in CF&I Steel Strand is subjected to rigid quality controls for overhead ground wire and is carefully galvanized, assuring long-lasting protection against corrosive elements.

CF&I Galvanized Strand is made in accordance with ASTM Specification A-363, in seven- or three-wire constructions. For guy, messenger and other applications, CF&I strand is made to ASTM Specification A-122. CF&I is also equipped to manufacture strand to our customers' own specifications.

For quick delivery, see your local electrical distributor or contact the nearest CF&I office.

7515

CF&I STEEL

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings Boise • Butte • Denver • El Paso • Farmington (N. M.) • Ft. Worth • Houston • Kansas City Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City San Francisco • San Leandro • Seattle • Spokane • Wichita

In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit New Orleans • New York • Philadelphia • CF&I OFFICE IN CANADA: Montreal

CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

Glenn R. Petersen has been named manager of marketing for the communications products department at General Electric Co; **Frank D. Hannell** has been made manager of product production engineering for the department, **George M. Dewire,** manager of personal pocket radio communications, and **Paul F. O'Neill,** specialist-utility relations, Major Appliance Division. Other appointments include: **Robert B. McClelland,** manager of employee and community relations, industrial heating department; **Donald L. Weyenth,** sales engineer for refrigeration controls, appliance control department; **Harold W. LeBoeuf,** manager of manufacturing, silicone products department; **Hicks B. Waldron,** manager of the Plainville, Conn., plant, distribution assemblies department; **Mario Alves,** manager of manufacturing, household refrigerator department.
Other appointments at General Electric Co: **Charles J. Graham** to marketing manager, lightning arrester and cutout product section; **Herbert Eaton,** manager of marketing administration, intermediate distribution sales section, component and intermediate distribution sales operation; **Dr James R. Donalley,** general manager, insulating materials department. **Ray H. Luebbe,** secretary, will retire Oct. 1.

Westinghouse Electric Corp has named: **Carl E. Cannon,** product sales manager, for electric heating; **Earl S. Goodwin,** director of corporate purchases; **H. W. Rainey Jr,** marketing manager, Sturtevant Division; **W. J. Delaney,** executive assistant to the vice president and group general manager, and **Edwin H. Seim,** manager of the Baltimore Division, general products group; and **W. M. Chapman,** general sales manager, Westinghouse Electric International Co.

Combustion Engineering Inc has named **Thomas A. Ennis,** secretary and counsel, to the board of directors.

Sylvania Lighting Products, Sylvania Electric Products Inc, has named **George J. LaFreniere,** manager, data processing department.

Walter P. Matzelevich has been named Kyle plant manager at South

Milwaukee, for Line Material Industries.

Leonard F. Lang has been made manager of power industries engineering sales, Western Precipitation Division, Joy Manufacturing Co.

Donald L. Hemmenway, former senior technical director of Electric Light & Power Magazine has joined Arthur R. Mogge, Inc, advertising and merchandising organization, as technical director.

Robert O'Keefe has been named distributor sales manager of Burndy Corp's Utility-Industrial Division.

Daystrom, Inc, has promoted **Roswell W. Gilbert,** formerly vice president of research and development for the industrial products group, to director of corporate research, and has named **Harry R. Gillespie Jr** assistant general manager, potentiometers, of the Pacific Division.

Federal Pacific Electric Co has appointed **Felix C. Karlson** Eastern Regional manager. Elected as directors of Federal Pacific are **Octave Blake** and **Haim Beyer,** president and executive vice president of Cornell-Dubilier Electric Corp, and **John T. Romano,** Federal Pacific vice president.

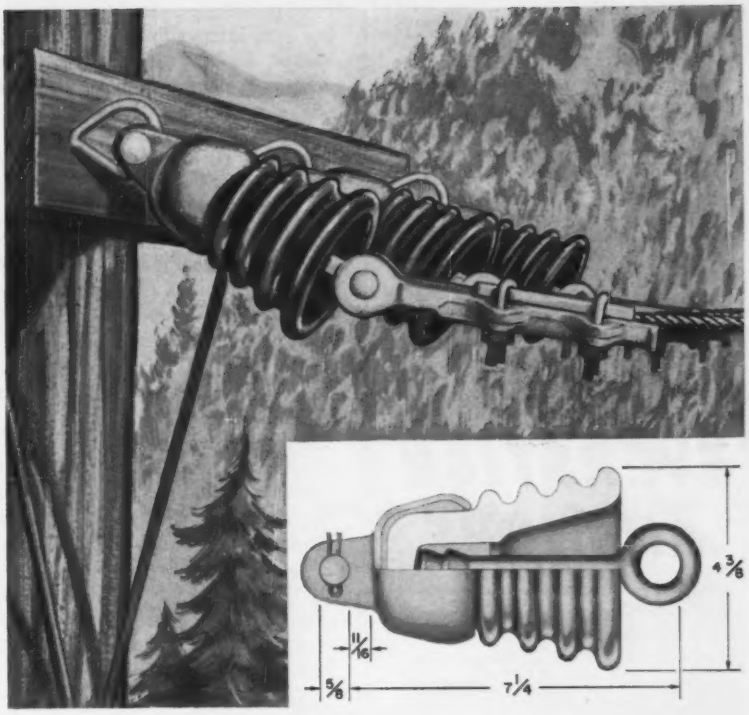
Newell W. Mitchell has joined the Bridgeport Brass Co as a consultant on corrosion problems in the heat exchanger field.

Frederick S. Oliver has joined the Phelps Dodge Copper Products Corp at its electrical research laboratory in Yonkers, N. Y.

Joseph C. Lowey, general manager of sales for Clayton Mark & Co, has been named promotional committee chairman of the conduit section for the National Electrical Manufacturers Assn.

Graybar Electric Co has made the following appointments: **R. C. Dunn** as manager, outside construction sales; **R. B. Buffinton** as manager, power apparatus sales, at Graybar's national headquarters in New York City.

Raytheon Co has elected two new vice presidents: **Stuart D. Cowan,**



Delta-Star Rugged Strain Insulators Cut Dead-Ending Costs 40% on 12.47 KV Lines

The new Delta-Star "Rugged" Strain Insulators cut the cost of dead-ending lines up to 12.47 KV by as much as 40%. One "Rugged" Insulator can be used to do the work of two conventional 6" or one 10" unit—without fear of cross-arm or pole top burning. Since "Rugged" Strain Insulators cost only slightly more than conventional 6" units, there is a large saving in initial cost. Installation costs are also slashed, since only one insulator must be installed instead of two. During hot line construction on nearby equipment, the "Rugged" Insulator lends itself to easy covering due to its smaller diameter.

Reason for the remarkable cost cutting possible with Delta-Star "Rugged" Strain Insulators is the new tubular contour, which practically eliminates crack and fissure damage during handling. Force of impact is spread over the entire insulator if dropped, instead of being concentrated on a single porcelain projection, as is the case with conventional 6" discs.

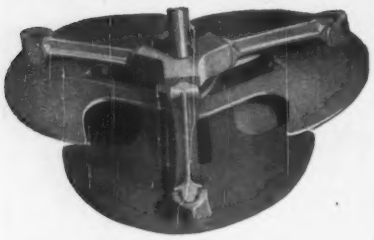
"Rugged" Strain Insulators have been field proven in six years of use. For complete information on how they can save you money, write to . . . *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 W. Fulton St., Chicago 12, Ill.*

DELTA-STAR PORTER **ELECTRIC DIVISION**

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



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ANCHORS

For new construction and maintenance — Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resiliant, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

Two New Minerallac Quality Products
Designed for Jobs Too Heavy for
Standard Jiffy Clips

MINERALLAC
Heavy Duty AND Medium
JIFFY CLIPS

Made of heavier materials! Has exclusive inverted rib, that provides more strength at the bend of clip . . . and, of course, adds the benefits of famous "Snap On" feature!

In stock in Zinc-Plated Steel for Thin Wall or Rigid Conduit up to 6". (Hot Dipped Galvanized may be obtained on order) Can be substituted for malleable clips.

Order From Your Electrical Wholesaler

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MINERALLAC ELECTRIC COMPANY
25 North Peoria St. Chicago 7, Ill.

MINERALLAC

vice president-commercial marketing and international services; and **Robert L. McCormack,** vice president and general manager of Industrial Components Division.

Glenn E. Crippen and **Vernon W. Ruskin** have formed a consulting engineering company, Crippen Ruskin & Associates Engineering Ltd, 207 West Hastings St, Vancouver, British Columbia. Crippen had been president of Crippen Wright Engineering Ltd, and Ruskin was director of planning of B.C. Engineering; IPEC, engineering consultants for B.C. Electric Co.

Electrical Conductor Division, Kaiser Aluminum & Chemical Sales, Inc, has named **Cecil R. Pickens,** insulated products sales manager.

D. M. Parrish has been named manager of RT&E Corp's new distribution transformer plant in Arlington, Tex.

Robert H. Devine has been appointed assistant vice president, Wood Preserving Division, Koppers Co, Inc.

D. W. Onan & Sons Inc has assigned **Curt Ashenbach** to the post of customer services manager.

Clarence K. Hood, a vice president of Worthington Corp has retired.

Graybar Electric Co has appointed **W. B. Whaley** as treasurer, succeeding **F. E. Gibson** who has retired.

OBITUARY

Charles A. Piper, 64, director of Potomac Edison Co . . . **Parker R. Grimes,** 50, chief of planning branch power section, engineering division, Walla Walla, Wash., district office of Corps of Engineers . . . **Leo Joseph Collins,** 60, commercial sales manager, Portland General Electric Co . . . **Ernest Sherman Fitz,** vice president, retired, of Virginia Electric & Power Co . . . **Ernest H. Cotton,** 63, vice president in charge of operations of Northern States Power Co . . . **H. Dale Cook,** 54, area development representative for Philadelphia Electric Co . . . **Philip M. Zenner,** 63, president of Royal McBee Corp.

SALES ASSIGNMENTS

COMPANY STAFFS

Westinghouse Electric Corp's Air Conditioning Division has appointed five sales engineers to new regions for electric heating products: H. J. Rudisaile, Chicago, Ill.; Edward A. Zagula, Pittsburgh, Pa.; E. W. L. Seager, Staunton, Va.; Arthur F. Holland, St. Louis, Mo.; and Foster Massey, Atlanta, Ga. The five regional agents, together with three others, will serve the entire US. The three others are: V. A. Labarthe, San Francisco, Calif.; L. C. Sheaffer, Seattle, Wash.; and C. B. Ross, Chattanooga, Tenn.

Yale & Towne Mfg Co has named Neal J. Kamp manager of the Yale Materials Handling Division's enlarged Chicago, Ill., branch. He succeeds Arthur H. Dobler, who has become a division executive officer. Dobler's headquarters is in the Wrigley Bldg, 400 N Michigan Ave, Chicago.

General Electric Co has named H. M. Carmichael insulator department sales manager for a 30-state zone with headquarters in Atlanta Ga. Other promotions at GE: Dean Daniels has become insulating materials department sales manager; Leonard J. Sacks has succeeded Daniels as silicone products department Western district sales manager, with offices at 10234 Lakewood Blvd, Doweny, Calif.; and James E. Hamlin has become silicone products department sales representative for the East Central district.

Minneapolis-Honeywell Regulator Co's Datamatic Division has opened a sales office in Detroit, with Donald F. Brosnan as branch manager. Headquarters temporarily will be at Honeywell's offices at 13631 Plymouth Rd. The division has also appointed Herbert F. Mitchell Jr regional systems sales manager, with offices in New York City at 261 Madison Ave.

Allis-Chalmers Mfg Co has made the following staff appointments in its Industries Group: W. C. Henderson as utility sales manager, and A. W. Leighton as industrial sales manager, both in the Los Angeles

district; Charles E. Muller as utility sales manager, San Francisco district; William S. Wright as manager of the Grand Rapids, Mich., district, succeeding J. A. Sudduth, who has been become St. Louis district manager; R. E. Morris as midwest region manager; Charles F. O'Riordan as north central region manager, succeeding M. M. York, who has been assigned to the Milwaukee branch; and Robert I. Carlson as utility sales manager and Clare K. Tubbs as industrial sales manager, Pittsburgh district.

Bailey Meter Co's S. G. Dukelow has succeeded retiring V. A. Rumble as San Francisco district manager. W. P. Davenport has replaced Dukelow as New Orleans district manager.

Graybar Electric Co, Inc, has two new branch managers; W. C. White at Sacramento, Calif., and E. H. Williamson at the Tulsa, Okla., branch. F. D. Bethel has become manager, appliance sales, at Knoxville, Tenn.

Daystrom, Inc, has named L. P. Duck to succeed Edwin O. Brown as manager of Weston Instruments Division's Syracuse, N. Y., district. Brown has become the division's Philadelphia district manager.

Cerro de Pasco Corp's division, Rockbestos Wire & Cable Co, has appointed John H. Cosmar sales manager for New England.

H. K. Porter Co, Inc, has appointed John E. Tomes manager of the National Electric Division's Philadelphia branch.

Westinghouse Electric Corp has promoted Adolph Frankel to Chicago district sales manager of the Lamp Division.

I-T-E Circuit Breaker Co has made the following appointments: Jack A. Lueckert as Syracuse, N. Y., district sales manager; Ernest Thompson as Phoenix, Ariz., district sales manager.

Taylor Fibre Co, Norristown, Pa., has two new sales engineers—Peter J. Longarzo and Thomas E. Coyle—in its New York office at 76 S Tyson Ave, Floral Park, L. I.

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The Meetings Calendar

JULY

Edison Electric Institute—Industrial Relations Committee joint meeting with Rocky Mountain Electrical League, Denver Hilton Hotel, Denver, Colo., July 21-22.

AUGUST

American Institute of Electrical Engineers—Pacific General Meeting, El Cortez Hotel, San Diego, Aug. 8-12.

Heat Transfer Conference & Exhibit—Sponsored by ASME and AICE, Statler-Hilton Hotel, Buffalo, Aug. 15-17.

Western Electronics Show & Convention—Los Angeles Memorial Sports Arena, Los Angeles, Aug. 23-26.

SEPTEMBER

• **Edison Electric Institute**—Street and Highway Lighting Committee, Salem, Sept. 1-2; EEI-AGA Accounting Division & Section Organization Meetings, The Pittsburgh Hilton, Pittsburgh, Sept. 15-16; Industrial Power & Heating Group, Milwaukee, Sept. 21-23; Industrial Relations Committee, 13th Annual Round Table Conference, Drake Hotel, Chicago, Sept. 26-28.

Southeastern Electric Exchange — Personnel Administration Section, Roanoke Hotel, Roanoke, Virginia, Sept. 1-2; Accounting Conference, Tides Hotel, St. Petersburg, Florida, Sept. 29-30.

Association of Illinois Electric Cooperatives—Annual Meeting, St. Nicholas Hotel, Springfield, Sept. 7-9.

Northwest Electric Light & Power Association—53rd Annual Meeting, Glacier Park Lodge, Glacier, Mont., Sept. 7-9.

Joint Automatic Control Conference—Sponsored by ISA, ASME, AIEE, IRE, AIChE, Massachusetts Institute of Technology, Cambridge, Mass., Sept. 7-9.

Rocky Mountain Electrical League—Annual Fall Conference, Hilton Hotel, Denver, Colo., Sept. 7-10.

American Society of Mechanical Engineers—International Air Pollution Congress, Statler-Hilton Hotel, New York City, Sept. 10-11.

Electrical Living Show—New York Coliseum, New York City, Sept. 10-18.

Illuminating Engineering Society—1960 National Technical Conference, Penn Sheraton Hotel, Pittsburgh, Sept. 11-16.

Northwest Public Power Association—Accounting Section, Annual Meeting, Wenatchee, Wash., Sept. 14-15; Power Use Section, Annual Meeting, Hotel Monticello, Longview, Wash., Sept. 29-30.

• **Public Utilities Association of the Virginias**—42nd Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 15-17.

• **Municipal Electric Utilities Association of New York State**—30th Annual Conference, Lake Placid Club, New York, Sept. 15-17.

• **Pennsylvania Electric Association**—Annual Meeting, Penn Sheraton Hotel, Pittsburgh, Sept. 21-22.

• **Inter-Industry Farm Electric Utilization Council**—7th Annual National Electric Farm Power Conference, Kentucky Hotel, Louisville, Sept. 21-23.

• **National Power Conference**—Sponsored by American Institute of Electrical Engineers and American Society of Mechanical Engineers, Bellevue-Stratford Hotel, Philadelphia, Sept. 21-23.

• **Tennessee Valley Public Power Association**—Annual Meeting Power Use Section, Noel Hotel, Nashville, Sept. 26-27.

• **International Association of Electrical Inspectors**—Eastern Section, Wentworth-by-the-Sea, Portsmouth, N. H., Sept. 26-28.

• **Instrument Society of America**—Fall Instrument-Automation Conference & Exhibit and 15th Annual Meeting, New York Coliseum, New York City, Sept. 26-30.

• **Canadian Electrical Manufacturers Association**—16th Annual Meeting, Sheraton Brock Hotel, Niagara Falls, Canada, Sept. 28-30.

• Additions this week.

Electrical World's Second Street and Highway Lighting Conference—Hotel Ambassadors, Chicago, Ill., Oct. 19-20.

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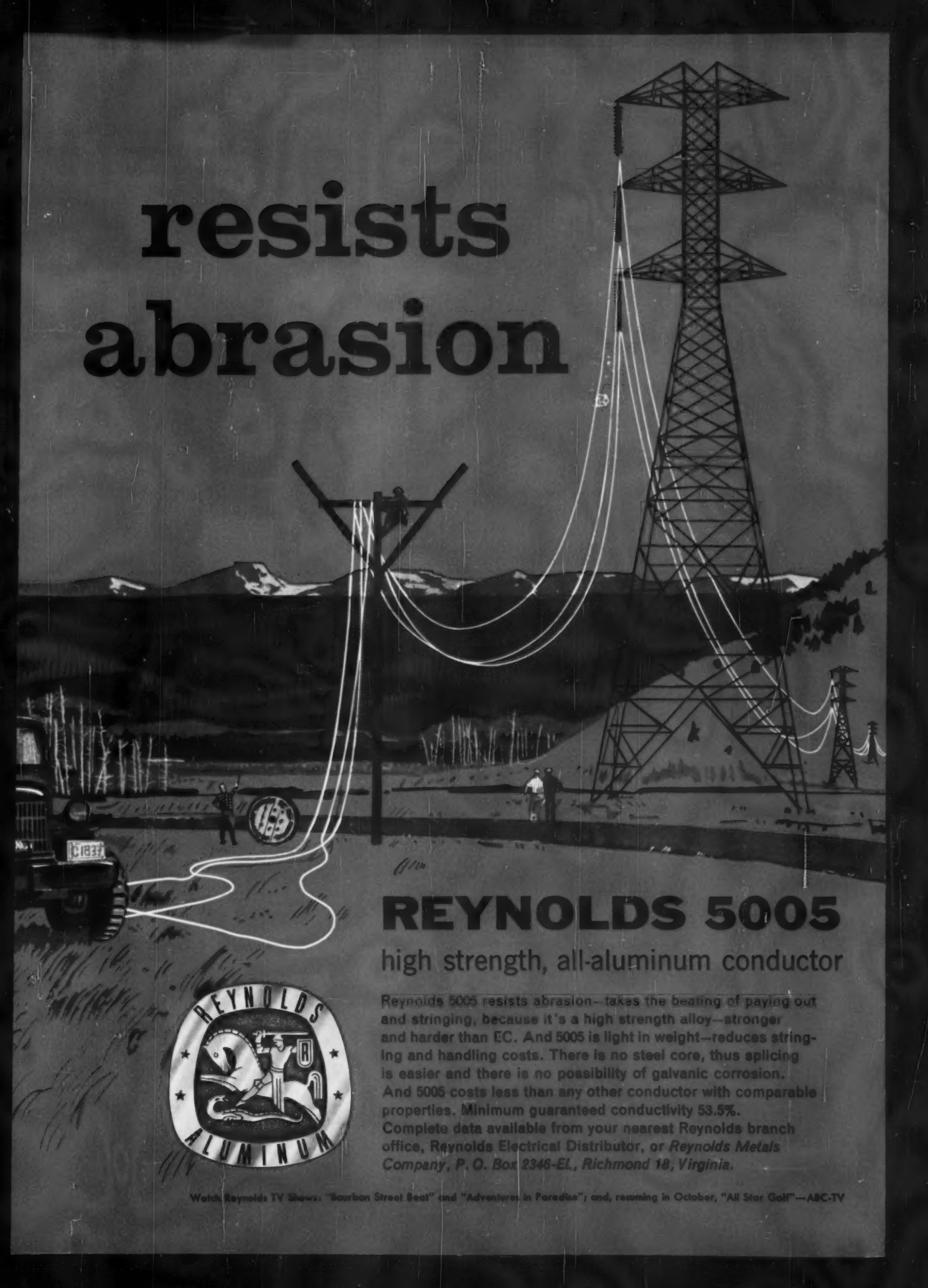
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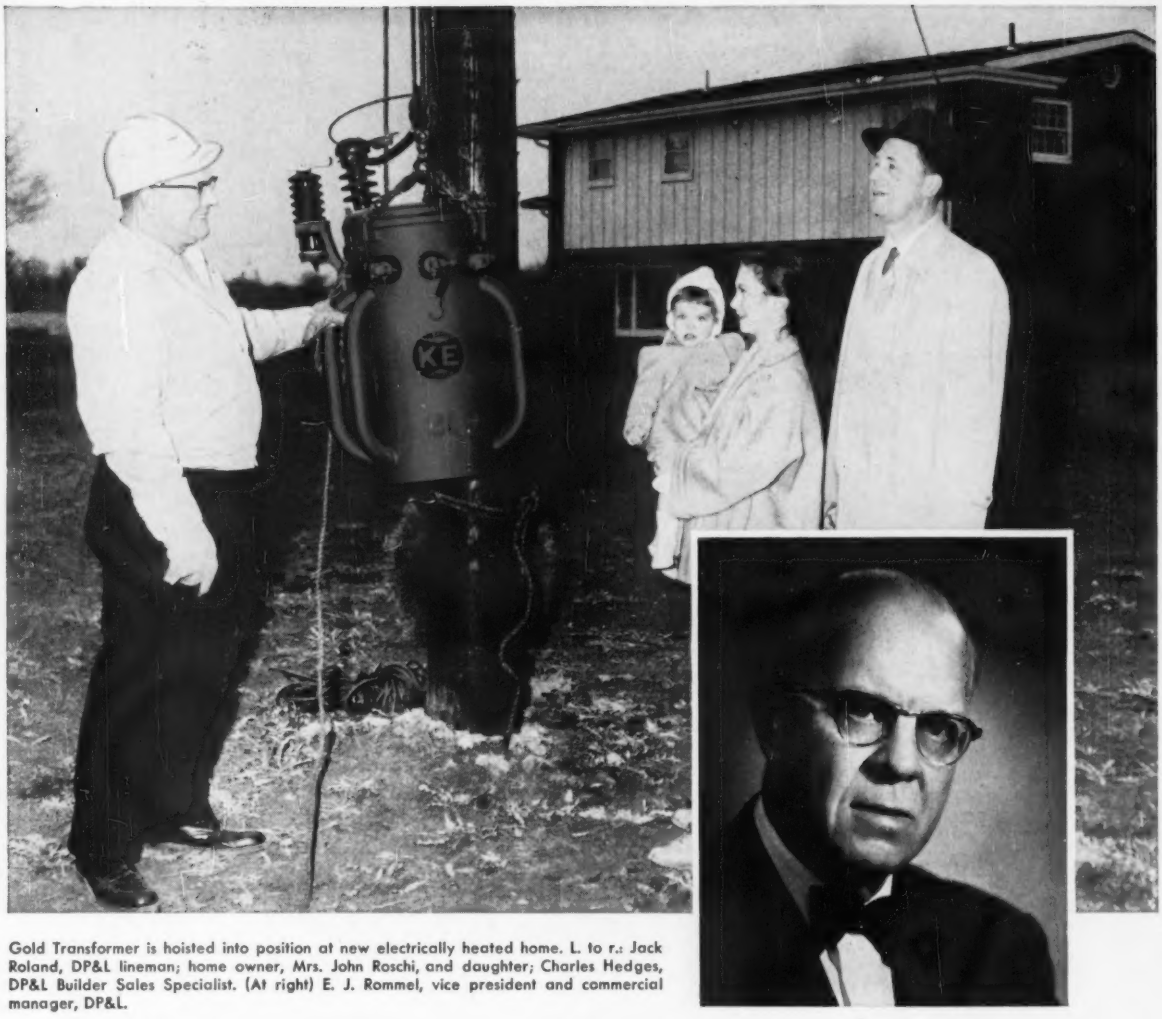
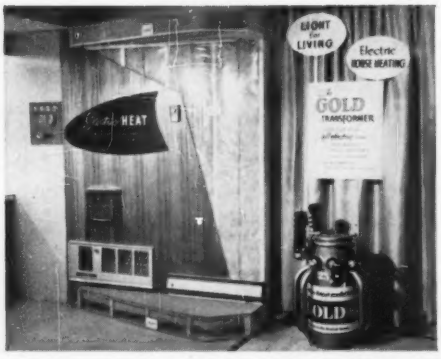


Gold Transformer is hoisted into position at new electrically heated home. L. to r.: Jack Roland, DP&L lineman; home owner, Mrs. John Roschi, and daughter; Charles Hedges, DP&L Builder Sales Specialist. (At right) E. J. Rommel, vice president and commercial manager, DP&L.

Dayton Power and Light installs GOLD TRANSFORMER to serve a new electrically heated home



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